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ERRATA

VOLUME XXII

page 463 lines 24 and 27 for 'leek' read 'onion'

531 delete *Citrivir psorosis* var. *concavum*, Citrus blind pocket psorosis, and Citrus concave gum psorosis entries

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12 line 8 for '*secalina*' read '*dispersa*'

119 25 for '*Trichoconas*' read '*Trichoconis*'

136 10 for '*mali*' read '*rubi*'

266 5 for 'ROLLENBACHER' read 'BOLLENBACHER'

293 2 for 'xxiii' read 'xxii'

302 23 for 'skin' read 'shin'

307 6 for 'Hildebrand (E. N.)' read 'Hildebrand (E. M.)'

307 11 insert 'and' after 'blackberry'

316 10 for '*A. zeae*, while *P.* [*A.*]' read '*zeae*, while *P.* (*A.*)'

374 32 for '*oxysporum*' read '*bulbigenum*'

382 48 for '*Chrosopogon*' read '*Chrysopogon*'

438 45 for '*Atropha*' read '*Atropa*'

512 34 for '*canadensis*' read '*canadense*'

IMPERIAL MYCOLOGICAL INSTITUTE

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VIRGIN (W. J.). **An unusual Bean disease.**—*Phytopathology*, xxxiii, 8, pp. 743–745, 1 fig., 1943.

Field and garden beans, especially of the Bountiful variety, grown for seed in southern Idaho, have been observed to suffer from an apparently new disease, characterized by a marked reddish discoloration of the nodes, later extending to the veins and sometimes to the pods. The leaves are misshapen and the plants stunted, few pods are formed, and ripening is premature. The seeds are usually small, often shrivelled, and the coats deeply marked with target-like spots or concentric lines. The disease, which is most prevalent along the edges of bean fields, is believed from the evidence available to date to be caused by a virus closely allied to bean virus 2 (yellow mosaic) [*R.A.M.*, xvii, p. 90]. The plants developing from 48 seeds from affected plants grew to maturity without showing any symptoms of the virus, which is thus apparently not transmissible by way of the seed.

JENKINS (ANNA E.) & VIÉGAS (A. P.). **Stem and foliage scab of Sweet Potato (Ipomoea batatas).**—*J. Wash. Acad. Sci.*, xxxiii, 8, pp. 244–249, 2 figs., 1943.

In connexion with the recent detection of stem and foliar scab of sweet potato, due to *Sphaceloma batatas* Sawada (Descriptive catalog of Formosan fungi, Part 5, p. 105, 1931), on the island of Guam and in different parts of Brazil (in Alagoinhas by Fawcett and Bitancourt in 1937 and in Campinas by Costa in 1939), the writers summarize the available information on the disease, including that contained in the Japanese papers by Sawada and Goto (*Ann. phytopath. Soc. Japan*, vii, pp. 143–145, 1937), and reproduce the original diagnosis of the pathogen. On stem cankers from Campinas a species of *Elsinoe* was found which is suspected of being the ascigerous stage of *S. batatas* and is named *E. batatas* n.sp.

Under the conditions prevailing in São Paulo and Bahia, Brazil, the spots produced by *E. batatas* on the interveinal areas, veins, and petioles are usually circular, small, and mikado-brown on the dried specimen, those on the stems being circular, elliptical, or elongated, Hay's brown, often with a wood-brown centre; the mycelium is at first intraepidermal and then passes to the subepidermal tissue, causing hypertrophy of the cortical parenchyma and collenchyma, followed by collapse and necrosis of the affected regions; during this process the dark grey hyphae develop into an external stroma, 20 to 60 by 16 to 20 μ, with a single row of globose asci, 15 to 16 by 10 to 12 μ, containing 4 to (?) 6 hyaline, septate curved spores, 7 to 8 by 3 to 4 μ.

The specimens submitted by R. G. Oakley from Guam in 1937 were examined by the senior writer and Sawada and found to agree with the original description of the disease and its agent. A conspicuous feature of the disease in the field was the high, erect growth of the shoots. In 1938 the incidence of infection declined, and in 1939 diseased plants were scarcely to be found.

General review of research work.—*Rep. E. Malling Res. Sta., 1942*, pp. 22–30, 1943.

R. V. HARRIS (pp. 22–24) states that when plum bark extracts were tested against *Pseudomonas mors-prunorum* [*R.A.M.*, xxii, p. 100] in culture, no differential effect correlated with origin from resistant or susceptible varieties was observed. The organism utilized a wide range of food materials and resistance did not appear to be due to their shortage. Bark tissue was invaded intercellularly, cells being entered only after collapse.

H. B. S. MONTGOMERY, M. H. MOORE, H. SHAW, and W. STEER (pp. 25–27) state that in further spraying tests against apple scab [*Venturia inaequalis*] phenyl mercury chloride proved highly fungicidal, though not entirely safe. Of the inorganic sulphur sprays (tested at equivalent sulphur based on 1 per cent. lime-sulphur), colloidal sulphur alone, and lime-sulphur alone or as mixtures with commercial elementary sulphur preparations proved to be the most effective against scab. Tetramethylthiuram disulphide was unsatisfactory. Spray treatment of Allington Pippin and Worcester Pearmain apple trees in full bloom with 1 per cent. lime-sulphur or 0·5 per cent. colloidal sulphur reduced scab and did not decrease the crop. Infection by *V. inaequalis* was light in 1942, in contrast to 1941, but moderate annual dressings of sulphate of ammonia applied over a period of years to well-grown Cox's Orange Pippin and Allington Pippin trees had a cumulative effect in increasing susceptibility to scab. This, however, did not apply to sickly trees of the same varieties. Grassing down Cox's Orange Pippin trees appeared to reduce canker [*Nectria galligena*].

W. G. KEYWORTH (pp. 28–29) states that increased publicity was afforded to the need for the prompt notification of outbreaks of *Verticillium* wilt [*V. albo-atrum* and *V. dahliae*: ibid., xxii, p. 175] of hops and the application of control measures. Twenty-two new outbreaks were reported. Evidence was obtained that the blowing-about of infected plant debris is probably partly responsible for spread. Two new outbreaks of *Armillaria mellea* [ibid., xxii, p. 39] were found. Fuggle cuttings from 33 farms in the Kentish Weald and 16 in Worcestershire were inarched to mosaic-susceptible Golding hops. The grafts showed that 78 of the 95 Weald Fuggles (from 32 of the 33 farms) and 52 of the 74 Worcester Fuggles (from 14 of the 16 farms) were infected with mosaic. This shows how undesirable it is that Fuggles and Golding hops should be planted in close proximity, a view confirmed by field surveys.

CONNERS (I. L.) & SAVILE (D. B. O.). **Twenty-second Annual Report of the Canadian Plant Disease Survey, 1942.**—xix+110 pp., 1943. [Mimeographed.]

In this report [cf. *R.A.M.*, xxii, p. 9], it is stated that stem rust (*Puccinia graminis*) caused almost no damage to wheat in Canada in 1942. Leaf rust (*P. triticina*) was fairly prevalent on the stem rust-resistant varieties Thatcher and Apex, but only slight on Regent and Renown, which are resistant to both rusts. Additional evidence was obtained in New Brunswick that local epidemics of crown rust (*P. coronata*) and stem rust (*P. graminis*) on oats are due to plantings of the alternate hosts.

Browning root rot (*Pythium* spp.) [ibid., xxii, p. 26] caused very severe lesions of the roots of cereals, but growing conditions being favourable, recovery was general and yields moderate, although the damage delayed ripening and increased susceptibility to frost injury. Isolations from field material indicated that foxtail millet (*Setaria italica*) and broomcorn millet (*Panicum miliaceum*) may sustain considerable damage from browning root rot.

The possibility of leaf blotch of oats (*Helminthosporium avenae*) being at times an important seedling blight in Canada is indicated by its high incidence in the

seed, the relatively severe leaf infections in the field following sowing of heavily infected seed, and by its presence under cool greenhouse conditions. Primary infection of barley in net blotch (*H. teres*) and spot blotch (*H. sativum*) of barley may also be largely due to infected seed.

Covered smut (*Ustilago hordei*) and black (loose) smut (*U. medians* or *U. nigra*) of barley were prevalent in Plush barley in Manitoba, destroying 40 to 50 per cent. of the heads in some fields.

Crown rot of lucerne, due to a low-temperature Basidiomycete [ibid., xxii, p. 27], was very destructive in the early spring in Alberta, and did considerable damage in north-eastern Saskatchewan. Witches' broom of lucerne [ibid., xxii, p. 240], due to a virus, is reported from British Columbia, this being the first definite indication of its economic importance in Canada.

Flax rust (*Melampsora lini*) was general and reached epidemic proportions in some fields in the Prairies. It was most severe on the Bison variety; Redwing was fairly susceptible, while Royal appeared to be quite resistant. Observations indicated that rust was worse in fields near those carrying flax the previous year or where bits of rusted straw were present in the seed.

Pod and stem blight (*Diaporthe phaseolorum* var. *sojae*) was the most important disease of soy-beans in Ontario. Both blight and anthracnose (*Colletotrichum glycines*) are stated to be new to Canada.

Bacterial blight (*Xanthomonas phaseoli*) and especially halo blight (*Pseudomonas medicaginis* var. *phaseolicola*) were generally prevalent on beans and particularly destructive in southern Alberta. Aster yellows continues to be destructive in carrots in the Maritime Provinces. A yellows, believed to be due to the beet curly-top virus, is reported on carrots in the Okanagan Valley, British Columbia, where two new diseases were also observed, namely, downy mildew (*Peronospora schleideniana* [*P. destructor*]), which destroyed about half the onion crop, and anthracnose (*Marssonina panattoniana*) on lettuce. *Phoma betae* and *Ramularia betae* were found for the first time causing leaf spots of swiss chard [*Beta vulgaris* var. *cicla*] in Canada. Potato virus X, one of the components causing streak in tomatoes in mixed-virus infections, was found alone for the first time in Ontario in tomatoes in which it caused an indistinct vein-banding.

Bacterial ring rot (*Corynebacterium sepedonicum*) of potato affected approximately half the commercial acreage in southern Alberta, and has spread to the Eastern Irrigation District. It was observed for the first time in British Columbia and was also present, though in negligible amounts, in certified stock in the other Provinces, except Nova Scotia. For the second year only a single case was found in Prince Edward Island; in New Brunswick it has apparently been controlled in certified seed, but in Quebec it continues to be prevalent, due to disregard of sanitary measures. To prevent still further the possible contamination of healthy stocks of certified seed, the table stock of each grower is inspected and if ring rot is found in any field on his farm no seed stocks are certified from that farm.

A careful survey of plantings of 'English' potatoes revealed no additional cases of wart (*Synchytrium endobioticum*) in Nova Scotia.

Purple top of potatoes, possibly caused by the aster yellows virus [ibid., xxii, p. 493], was unusually prevalent in the Maritime Provinces, where it has been observed more or less frequently since 1939, more and more plants becoming affected as the season advances. The disease was most common in Katahdin, attacking only a few plants of Green Mountain.

The Wisconsin leaf spot of tobacco (*Pseudomonas mellea*) occurred in epidemic form in Quebec, this being the first record in Canada. Tobacco mosaic in Ontario and Quebec is apparently due partly to the virus of tobacco mosaic and partly to that of cucumber mosaic, the latter virus being more prevalent than the former in Quebec, where pipe and cigar-leaf tobacco is grown in comparatively small plots.

Fireblight (*Erwinia amylovora*) of apple, first reported from Alberta in 1941, is quickly becoming established there. Perennial canker (*Neofabraea perennans*) was prevalent in the Okanagan Valley, British Columbia, but losses have been greatly reduced since the introduction of the woolly aphid parasite, *Aphelinus mali*.

Isolations indicated that most of the blossom and twig blight in cherry and plum in the coastal region of British Columbia is due to *Sclerotinia laxa*, although *S. fructicola* also occurs. Bacterial blight (*X. pruni*) was of considerable importance on peaches in Lincoln County, Ontario, particularly in orchards on Lake Ontario. Western X disease of peach has increased in the southern Okanagan Valley, British Columbia, since the first survey in 1940. Trees affected by this virus are often difficult to detect. Although X disease was found in the Niagara Peninsula, Ontario, only in 1941, it is believed to have been present there several years earlier. Evidence has been collected that the chokecherry [*Prunus virginiana*] is not essential for the spread of this disease, but that it may spread directly from peach to peach over considerable distances. X disease was also found severely attacking chokecherries near Brighton and Port Hope, to the east of Toronto.

Shot hole (*Cercospora circumcissa*) severely affected plums and Sioux sandcherry [*Prunus besseyi*] in Manitoba. This is the first report of the fungus in the Survey, but it is represented in the Herbarium by specimens on *P. virginiana* from Quebec and on this host and on *P. serotina* from Ontario.

Further mentioned are leaf spot (*Labrella coryli*) on *Corylus rostrata* in British Columbia; brown mould (*Gonatorrhodiella highlei*) associated with *Nectria* canker on beech in New Brunswick and Nova Scotia; canker and die-back (*Fusarium lateritium* var. *mori*) on mulberry, and leaf blight (*Rhabdogloeum pseudotsugae*) associated with *Rhabdocline* on Douglas fir in British Columbia.

New records of diseases of ornamentals are bacterial blight (*X. incanae*) on greenhouse stocks in Ontario; anthracnose (*Sphaceloma rosarum*) on rose in British Columbia and Manitoba; stem rot (*Sclerotinia sclerotiorum*) on tulip in British Columbia; and rust (*Endophyllum sempervivi*) on *Sempervivum* spp., new to Ontario, but previously reported from British Columbia.

Seventeenth Annual Report of the Department of Scientific and Industrial Research, New Zealand, 1941–1942.—44 pp., 1943.

In this report [cf. *R.A.M.*, xxii, p. 125] it is stated that experimental evidence in New Zealand indicated that the period of maximum susceptibility of Granny Smith apples to superficial scald was between the ninth and the twelfth weeks of cold storage. When fruits of two pickings were stored in plain and oiled wraps, the latter delayed the appearance of scald by eight and eleven weeks in the first and second pickings, respectively. The evidence indicated that whatever the date of picking or the kind of wrapper used, scald is reduced to a minimum if the fruit is stored immediately or if storage is delayed for not less than four weeks. Long-delayed storage, however, produces undesirable effects on maturity and favours attack by fungi. The most successful results in the cold storage of Granny Smith apples appear to be given by using oiled wraps, storing immediately, and avoiding early picking.

In further studies on the effects of manurial treatments on the storage quality of apples [ibid., xxi, p. 3], nitrogen again greatly increased susceptibility to breakdown and fungal attack in Cox's Orange Pippin, though it reduced wilt. Phosphorus and potassium without nitrogen gave less breakdown and fungal infection, but more wilt, than the untreated control. With Dunn's Favourite, a heavy application of 4 lb. [? per tree] ammonium sulphate in addition to the normal dressings of phosphorus and potassium increased both breakdown and fungal infection. With Jonathan, applications of 2 and 4 lb. ammonium sulphate caused progressive increases in the incidence of breakdown, but only the heavier applica-

tion increased fungal attack. Potash again reduced the incidence of breakdown and fungal infection, particularly in late pickings, and only slightly increased Jonathan spot. The storage quality of Delicious apples continued to be unaffected by manurial treatments. In the case of the Sturmer variety, nitrogen, unbalanced by phosphorus and potassium, greatly increased breakdown and infection, but reduced wilt.

Tests on the effects of various sprays and other factors on the incidence of ripe spot of apples (*Neofabraea malicorticis*) [ibid., xxii, p. 126] suggested that fruit maturity and storage conditions are the main factors influencing the development of this disease. Unsprayed control fruit developed considerable ripe spot in cold storage, but this was reduced by 57 and nearly 95 per cent., respectively, where lime-sulphur had been applied as a summer spray and late summer applications of Bordeaux mixture had been used.

Bacterium [*Xanthomonas*] *pruni* [loc. cit.] is widespread throughout New Zealand on plum, and spray experiments for its control are in progress.

Onion downy mildew [*Peronospora destructor*] was largely controlled by Bordeaux sprays with various spreaders and wetting agents, with the result that increased yields were obtained. Pre-emergence damping-off of peas, which induces severe mortality and loss of vigour in early-sown plants under conditions of high soil moisture, was controlled by copper oxide and copper carbonate dusts, the former being slightly the more effective. Bean wilt [? *Pseudomonas medicaginis* var. *phaseolicola*: ibid., xix, p. 644] is becoming a serious problem. The only practicable method of control is to plant resistant varieties. Of 41 commercial varieties tested in three localities, only two were found to be immune, though several others were resistant enough to suffer only negligible loss. These are being propagated in order to build up stocks of seed.

The commercial production of high-alkaloid ergot [*Claviceps purpurea*] on rye [ibid., xxi, p. 453] appears to offer small prospects of success in New Zealand.

During the past three seasons, the amount of mosaic on typical blocks of tobacco at the Tobacco Research Station [ibid., xxii, p. 126] has been reduced from over 40 to under 5 per cent. initial infection. This result has been due mainly to the removal of sources of infection and careful handling of the seedlings. The results obtained during the present season showed that the percentage of mosaic was higher among pricked-out than bed-sown plants. This difference was most apparent with the higher rates of manurial treatment in the seed-bed. With both kinds of plants, mosaic incidence increased when the manurial treatment of the seed-bed was increased but on the whole the increments were small. Doubling the rate of application of standard fertilizer in the field did not appreciably increase the percentage of initial mosaic. The continuous tobacco plot and the alternate oats–tobacco plots showed 2·3 and 1·8 per cent. mosaic, respectively. Incorporation of tobacco trash in the seedling-bed soil increased mosaic in the seedlings. Soil suspensions from a bed treated two months before with tobacco trash when inoculated into tobacco seedlings gave 50 per cent. infection. Milk spray (1 : 10 with water) gave some protection against mosaic in the seedling-beds.

[Waterston (J. M.).] **Plant pathology.**—*Rep. Dep. Agric. Bermuda, 1942*, pp. 8–9, 1943.

The spread of fungal and bacterial diseases was promoted by wet weather during the period under review [cf. *R.A.M.*, xxi, p. 321]. Cabbage and broccoli were attacked by *Xanthomonas campestris* and tomatoes by *X. vesicatoria*. The Sebago potato variety showed satisfactory resistance to blight (*Phytophthora infestans*) [ibid., xx, p. 31 *et passim*], the incidence of which was reduced by the use of spraying equipment provided by the Department of Agriculture. *Fusarium oxysporum* caused rotting of late-planted potatoes [ibid., xvi, p. 57], and the

completion of planting by 15th February is consequently recommended, so that digging may be carried out before the end of May. Bliss Triumph potatoes raised from Nebraska seed suffered heavy damage from scab (*Actinomyces scabies*), which was much less severe on those of Nova Scotian origin, even when both lots were grown in the same field. Stigmatomycosis (*Nematospora coryli*) was prevalent on string beans and Lima beans [*Phaseolus lunatus*], following infestation by the insect *Nezara viridula* in August. Fig plants imported from California were infected by a hitherto unobserved disease assumed to be mosaic (*Ficus* virus 1) [see below, p. 33]. *Phytomonas* [*X.*] *juglandis* attacked Placentia English walnut, while the adjacent Eureka variety remained healthy; these trees were also of Californian origin. The following fungi were found for the first time on diseased Bermuda cedar [*Juniperus bermudiana*]: *Pestalotia conigena*, *P. micheneri*, and *Stigmatea juniperi*; *Pithya cupressi* was isolated from cedar foliage, and year-old seedlings were killed by *Gymnosporangium bermudianum*.

A number of new records were added to the mycoflora of the Islands, on which the writer is engaged in collaboration with F. J. Seaver [ibid., xxii, p. 153].

Waters (H. B.). **Report on the Department of Agriculture, Gold Coast, for the year 1942–43.**—8 pp., 1943.

Swollen shoot continued to attack cacao trees in the main area of infection from Koforidua to Suhum during the period covered by the report [cf. *R.A.M.*, xxii, pp. 13, 423], while outbreaks were also located in Akim (where they form a chain along the western side of the Atewa range as far south as the previously detected focus at Kobriso) and south-west of Kwahu. From October, 1942, spraying was omitted from the control programme, thereby expediting the treatment of over 200 outbreaks involving upwards of 89,000 trees. At the road barriers against the transference of planting materials several lots of pods and seedlings were seized. Swollen shoot appears from careful observations to spread relatively slowly, and it is hoped to organize an intensive survey of the whole cacao belt to determine the areas in which the industry could be protected by effective treatment. Some promise of varietal resistance to swollen shoot was obtained in tests at Tafo, and further work along these lines, comprising a wider range of West Indian types, has been planned.

Xanthosoma violaceum has proved highly, and two other introduced varieties fairly, resistant to coco-yam root rot [ibid., xix, p. 581], against which the 'roguing and replanting' treatment was once more successful. The virus theory of the origin of the disease is supported, but not established, by pot experiments.

Botany.—*Rep. Ga Exp. Sta., 1942–43*, pp. 40–48, 2 figs., [1943].

This report [cf. *R.A.M.*, xxii, p. 126] contains, *inter alia*, the following items of phytopathological interest. Applications of Bordeaux mixture to Muscadine [*Vitis rotundifolia*] grape vines for the control of black leaf spot due to a species of *Guignardia* [loc. cit.] induced a deeper colour of the foliage but no significant increase of yield. The disease was very severe on the unsprayed vines many of which lost a large percentage of their leaves before September.

In trials for the control of groundnut leaf spot [*Cercospora arachidicola* and *C. personata*: ibid., xxi, p. 126], the increase in yield of Spanish groundnuts given by sulphur dusting was 143·6 lb. per acre, as against an average increase of 329 lb. per acre for the previous five years. Copper-sulphur (10–90) dust in 10 tests gave an average increase of 218·6 lb. per acre. On the North Carolina Runner variety, two tests with three applications of sulphur dust gave an average increase of 219 lb. per acre, and two tests with four applications one of 381 lb. per acre. Two tests with Bordeaux spray indicated that such spraying is probably more effective than either of the dust treatments. Dusted groundnuts may safely be harvested 10 to 14 days after undusted.

The evidence so far obtained indicates that among the organisms attacking the roots and stems of snap beans [*Phaseolus vulgaris*] and largely responsible for the short bearing life of this host in Georgia, *Sclerotium rolfsii*, *Macrophomina phaseoli*, and *Rhizoctonia* [*Corticium*] *solani* are the most important. Attempts to control pea diseases caused by *Ascochyta pinodella*, *Mycosphaerella pinodes* [ibid., xxii, p. 290], and *Septoria pisi* by fertilizer treatments were unsuccessful, but the fact that infection was very severe on the fertilizer plots, where peas had been grown for seven consecutive years, and was virtually absent from fields in the vicinity where peas had been grown only once every three or four years emphasizes the need for rotation.

The watermelon S87, resistant to wilt [*Fusarium bulbigenum* var. *tracheiphilum*], was offered to farmers and seed-growers under the name Georgia Wilt Resistant. Strain X32 continued to show more resistance to both wilt and anthracnose [*Colletotrichum lagenarium*: ibid., xxi, p. 512] than other strains. Several promising selections of cantaloupe melons have been developed which are highly resistant both to downy and powdery mildew [*Pseudoperonospora cubensis* and *Erysiphe cichoracearum*], but further selection is, however, necessary to fix the type. The new Panamerica tomato variety, developed from a *Lycopersicum pimpinellifolium* × Marglobe cross, appears to be more resistant to *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*] than any other commercial variety ever tested at the Station.

Soil and plant investigations. Fruits and nuts, vegetable crops and diseases. —*Rep. Hawaii agric. Exp. Sta., 1941–42*, pp. 85–111, 6 figs., 1943.

In this report [cf. *R.A.M.*, xx, p. 350], it is stated that papaw anthracnose, caused by a species of *Colletotrichum* (probably *C. gloeosporioides*) [ibid., xxi, p. 149], appears in Hawaii on immature fruits only when they are treated with methyl bromide for the control of the Mediterranean fruit fly (*Ceratitis capitata*), or kept under anaerobic conditions for several days. Chloropicrin was very effective against damping-off of papaw [ibid., xxi, p. 150], caused by a species of *Rhizoctonia* and *Pythium aphanidermatum*. It did not, however, control subsequent infection. In a test in which this chemical was applied at the rate of 6 c.c. per cu. ft., the untreated control gave 71 per cent. total emergence, 0 per cent. post-emergence damping-off, and 71 per cent. final stand, the corresponding figures for *Rhizoctonia*-infected lots being 58, 53, and 5 per cent., for treated similar lots 80, 3 (insect larvae responsible), and 77 per cent., for *Pythium*-infected lots 51, 30, and 21 per cent., for treated similar lots 82, 0, and 82 per cent., and for treated infected lots reinfected with *Pythium* 9, 8, and 1 per cent.

Early in 1941, a third strain of bean rust (*Uromyces phaseoli typica*) [*U. appendiculatus*: ibid., xx, p. 556] appeared in Hawaii, to which four bean varieties which had been recommended as substitutes for the Lualualei variety proved to be susceptible. Other varieties, never before attacked, were highly susceptible or only slightly resistant.

During the period under review, 54 tomato varieties were tested for resistance to spotted wilt [ibid., xix, p. 482]. The selection BC-10 from the California Agricultural Experiment Station has so far remained immune in areas where susceptible varieties are severely affected. In 1941, the German Sugar variety (received from Honolulu) was ascertained to be highly resistant. Seeds of this variety were tested in a highly infected area at Kailua, Oahu, and its resistance was established.

Plant tumor bacteria.—*Science*, N.S., xcviii, 2537 (*Suppl.*), p. 10, 1943.

Further studies by P. R. White on the genesis of crown gall [*Bacterium tumefaciens*] in plants [*R.A.M.*, xxii, p. 241 and next abstract] have shown that the bacteria can be deprived of the tumour-producing capacity by culture on glycine-

containing media. The organisms thus treated can live in the host tissues, but excrescences do not develop unless the top of the plant is cut off and the tissues surrounding the point of inoculation treated with a hormone solution. Even then, however, bacteria isolated from the galls thus induced cannot form new tumours without the further aid of a growth-promoting substance. On the other hand, the introduction into healthy plants of germ-free tumours results in the development of large, malignant growths, indicating that the host cells have undergone in White's phrase a 'permanent and irreversible cancerization'.

To test the validity of the hypothesis that the bacteria themselves are not the agents of crown gall, but merely act as carriers of an infective virus, Madagascar periwinkle (*Vinca rosea*) plants were inoculated with *Bact. tumefaciens*. At 115° F. no symptoms developed, but at ordinary greenhouse temperature tumours were produced normally. In the meantime the bacteria had disappeared, having presumably first transmitted to the host tissues a tendency to pathological multiplication.

White (P. R.) & Braun (A. C.). **A cancerous neoplasm of plants produced by autonomous, bacteria-free crown-gall tissue.**—*Proc. Amer. phil. Soc.*, lxxxvi, 3, pp. 467–469, 1943.

Some further information is presented concerning the development in sunflowers of malignant secondary tumours after the elimination of the original pathogen, *Phytomonas* [*Bacterium*] *tumefaciens* [see preceding abstract]. Of 181 such excrescences, which arise near the vascular bundles at a distance of one or more internodes from the primary site of infection, tested during recent months, only seven (4 per cent.) yielded cultures of the crown-gall organism. Normal sunflower cells in tissue culture develop very slowly, increasing only about 250-fold in volume in a year in contrast to those from secondary crown-gall tumours, for which the corresponding figure exceeds 1,000,000,000,000-fold. The metastatic neoplasms are glistening white, except for occasional brown patches of necrotic cells, their surfaces being covered with innumerable white tubercles representing localized centres of more rapid growth. They are firm, friable, and contain scattered scalariform cells, which are not, however, organized into any coherent system. No bacteria were recovered from 600 such cultures subjected to careful bacteriological tests, while negative results were also given by serological experiments and others involving the use of a nutrient medium known to support the growth of *Bact. tumefaciens*. Moreover, on re-implantation into the host, living fragments of bacteria-free secondary tumour tissues rapidly induce the formation of typical crown galls. From about 600 such grafts made during the past year, 133 typical tumours have been obtained, ranging in size from minute nodules to a walnut. Successful grafts were made from tissue cultures derived from 11 distinct tumours, some of which had previously been carried in culture for over a year, through 25 successive passages.

It is apparent from these data that the autonomous, parasitic, and malignant behaviour acquired by the secondary tumours under the indirect influence of bacteria originally located in some distant part of the plant becomes an intimate function of the cells themselves, independent of any further external stimulation. These characteristics, not heretofore convincingly demonstrated in relation to plant tissues, are regarded as closely analogous to those of animal cancers, and the material at hand holds out great promise for the investigation of the fundamental cellular changes forming the biological bases of the 'cancer problem'.

Grieve (B. J.). **Mechanism of abnormal and pathological growth : a review.**—*Proc. roy. Soc. Vict.*, N.S., lv, 1, pp. 109–132, 1943.

Recent studies on the mechanism of abnormal and pathological growth in plants

are reviewed and critically discussed, with special reference to the effects induced by *Bacterium tumefaciens*, *Bact. solanaccarum* [*R.A.M.*, xxi, p. 91], and *Rhizobium* spp. The hypothesis that indole-3-acetic acid, evolved by the pathogen in the plant, stimulates all proliferation or comparable processes is regarded as untenable, nor has it been conclusively shown that the physical presence of the bacteria leads to morbid reproductive activity through enhanced growth substance production. There are, however, strong indications that some growth substance mechanism operates in infected plants, and it is suggested that the crown gall problem, for instance, should be approached by an intensive study of the auxin and 'food factor' relationship in normal and diseased individuals.

THOROLD (C. A.). **Witches' broom disease investigations. V. Large-scale experiments on direct control.** —*Trop. Agriculture, Trin.*, xx, 9, pp. 176-181, 1943.

In further studies on the control of cacao witches' broom [*Marasmius perniciosus*: *R.A.M.*, xxii, p. 471], an experiment was carried out on River Estate, Trinidad (an area of severe incidence) in 1941-2 in which the brooms were removed over an area of about 80 acres between April and August; adjacent and surrounding fields totalling about 140 acres remained untreated. In the following year, the treated and untreated areas on this estate were reduced to 25 and 62 acres, respectively. The removal of the brooms began in March, 1942, and was completed by the end of May, and there was a second removal on 12 acres in November and December, 1942. A similar test was conducted in an area of moderate incidence, the Philippine Estate. Here the treated and surrounding untreated areas consisted of about 40 and 50 acres, respectively, in both seasons. Removal of brooms began in June, 1941, and was finished in the middle of August, 1941. There was a second removal in October and November, 1941. In the following year the removal of brooms began in March and was completed in April, and there was a second removal in October and November. In each experiment, 500 trees (treated and untreated) were kept under observation in both seasons.

In the first season, the results indicated that the large-scale clearances of brooms in the treated areas were effective in reducing disease incidence, both as regards broom and pod infection. Thus, on the River Estate, the mean number of brooms per tree was 103·1 and 181·1 for the treated and untreated areas, respectively, while the pod infection was 37·01 and 41·78 per cent., respectively. On the Philippine Estate the corresponding figures were 8·5 and 21·8 brooms and 7·89 and 24·21 per cent. pod infection. In 1942-3, however, the results obtained were negative, the figures for River Estate being 211·8 and 199·6 brooms per tree, and 24·40 and 13·38 per cent. pod infection for the treated and untreated areas, respectively, while on the Philippine Estate the figures were 12 and 13·6 brooms and 15·45 as against 16·61 per cent. pod infection.

These results do not support earlier observations (made on an area of under two acres) that a centre of infection may seriously affect the adjacent cacao for a distance of only about 100 yds. Also, they do not show that trees from which no brooms are removed have any harmful effect on neighbouring trees. It is, therefore, concluded that the removal of brooms is not effective in controlling the disease on areas of 25, 40, or 80 acres. Efforts at control should now be concentrated on the development of resistant types of cacao.

KÜTHE (K.). **Dauerhaftes Ausrotten der Berberitzensträucher zur Bekämpfung des Getreideschwarzrostes.** [Permanent eradication of Barberry bushes for the control of cereal black rust.] *NachrBl. dtsch. PflSchDienst*, xxiii, 1, pp. 3-4, 1943. [Abs. in *Chem. Zbl.*, cxiv(i), 23, p. 2437, 1943.]

In the control of cereal black rust [*Puccinia graminis*] the application to the soil surrounding barberry bushes of sodium chloride at the rate of 50 gm. per sq. m.

sufficed to destroy them completely, the actual uprooting of the shrubs being superfluous.

Saunders (A. R.). **Field experiments at Potchefstroom. A summary of investigations conducted during the period 1903–1940.** *Sci. Bull. Dep. Agric. S. Afr.* 14, 138 pp., 40 figs., 4 graphs, 1942. Price 1*s.* 0*d.*

In this report a summarized account is given of the data accumulated from nearly 40 years' field experiments on plant-breeding at the Potchefstroom Experimental Farm, South Africa. On p. 14 it is stated that wheat varieties highly resistant to stem rust [*Puccinia graminis*] in other countries are often completely destroyed by the local forms of the disease [*R.A.M.*, xvii, p. 442]. Not only are there physiologic forms of *P. graminis* in existence which are peculiar to South Africa, there is also strong evidence that such forms of other diseases are present. The distribution of these forms is not uniform over the whole country, and a particular form does not show the same severity of attack in all areas. Maize dry rot (*Diplodia zeae*), for example, is present throughout the maize-growing districts, and is highly destructive in some localities, while never causing serious losses in others.

Gottlieb (D.) & Hart (Helen). **Growth substances and the rust fungi.**—*Phytopathology*, xxxiii, 8, pp. 724–728, 1943.

Experiments were performed to determine the possible relationship of the water-soluble growth substances, thiamin chloride, riboflavin, nicotinic acid, ascorbic acid, and beta indole-acetic acid to the resistance of oats to four physiologic races of *Puccinia graminis avenae* and of wheat to seven of *P.g. tritici*. From the generally negative results the writers conclude that the vitamins in question do not play a major part in the reaction of these cereals to the two parasites tested, nor does it appear that pathogenic differences in physiologic races within a rust species are attributable to divergent growth substance requirements.

Holton (C. S.). **Chlamydospore germination in the fungus causing dwarf bunt of Wheat.**—*Phytopathology*, xxxiii, 8, pp. 732–735, 1 fig., 1943.

Chlamydospores of the race of *Tilletia tritici* [*T. caries*] responsible for dwarf bunt of wheat in Washington [*R.A.M.*, xx, p. 158] were induced to germinate by protracted immersion (upwards of three months) in tap water at 4° C., the maximum germination obtained by this method, however, being 30 per cent. Most of the germinating spores produced a promycelium with two to four branches, each bearing two to eight primary sporidia, some of which fused in pairs and usually gave rise to a mycelium, presumably the infection hypha. Relatively few sickle-shaped sporidia were formed. It is suggested that the type of structures produced by the germinating spores may in some way bear on the classification of the new race.

Mundkur (B. B.). **Karnal bunt, an air-borne disease.** *Curr. Sci.*, xii, 8, pp. 230–231, 1 fig., 1943.

Wheat plants attacked by *Neovossia indica*, which has recently been shown not to be seed- or soil-borne [*R.A.M.*, xxii, p. 472], differ from those infected by *Tilletia caries* and *T. foetida* in the absence of dwarfing or change of colour and in the localization of the pathogen in five or six kernels of a head in place of its diffusion through an entire ear, as in the case of ordinary bunt. One or two of the infected kernels are entirely converted into smut balls, the others being only partially invaded. The mode of infection of the kernels being suggestive of transmission by the wind, experiments were conducted at Delhi in February and March and at Simla in April, 1943, to test the validity of the assumption that the light, falcate sporidia of *N. indica*, whorls of upwards of 150 of which are borne at the apex of the promycelial tubes, are wafted on to the ears in the 'anthesis' or 'dough'

stage. Moore's vacuum method of inoculating the ears was used [ibid., xv, p. 567]. In the Delhi series, all five infected ears of I[mperial] P[usa] 114 and two out of six of IP165 developed the symptoms of 'Karnal bunt', the corresponding figures for Simla being six out of 64 of IP165, 12 out of 54 of C591, and 20 out of 303 of IP125. The germination of the spores of *N. indica* is very erratic and the exact conditions governing its occurrence require further investigation, though it is evident that a very low temperature and a sufficient degree of humidity are essential. In 1942, when the disease was epidemic, 2·54 in. rain fell during the second half of January and 4·51 in. in February, as against traces and 0·15 in., respectively, in the corresponding periods of 1943, when the incidence was negligible.

Ogilvie (L.). **'Blighty Wheat', or the blackening of Wheat ears.**—*Rep. agric. hort. Res. Sta. Bristol, 1942*, pp. 83–88, [1943].

Blackening of the ears of wheat, sometimes referred to by English farmers as 'blighty wheat', is stated to be caused by the fungi *Erysiphe graminis*, *Cladosporium herbarum*, *Alternaria* spp., and to a lesser extent *Septoria nodorum*. Severe incidence may be brought about in a wet season by a complex of factors, of which low potash status and lack of ventilation are the most important. Observations made in 1942 in Somerset, Wiltshire, Gloucestershire, and Worcestershire showed that low values of available potash in the soil were associated with the worst discoloration of the ears. It was found in variety trials that the tall-growing varieties tended to become 'lodged' and to develop subsequently very severe blackening of the ears, while short varieties retained their ears clean, probably owing to greater ventilation. The relatively resistant varieties were also the first in the order of ripening. Top-dressing of nitrogenous fertilizers may tend to encourage fungal infection and subsequently blackening of the ears by upsetting the nitrogen/potassium balance in potash-deficient soils, by delaying ripening, and by producing a leafy growth, which impedes proper ventilation.

Honecker (L.). **Erfahrungen und Beobachtungen über das Auftreten des Gerstenflugbrandes und über die Wirkung verschiedener Verfahren zu seiner Bekämpfung.** [Experiments and observations on the occurrence of Barley loose smut and on the effect of various processes on its control.]—*Prakt. Bl. PflBau*, xix, pp. 186–201, 1941–2. [Abs. in *Zbl. Bakt.*, Abt. 2, cv, 23–24, 1943.]

In order to minimize the risk of injury to barley seed-grain by the hot-water treatment against loose smut [*Ustilago nuda*], a method was devised involving two hours' immersion at 45° C. in a 0·075 to 0·1 ceresan solution, followed by an instantaneous dip in a cold solution of the same, and then by gradual drying. The new process was experimentally shown to be almost equally effective with the hot-water treatment and caused less delay in germination, while it stimulated the vigour of the plants.

Honecker (L.). **Aufgaben der Pflanzenzüchtung in der Kriegs- und Nachkriegszeit.** [Functions of plant breeding in the war and post-war periods.]—*Prakt. Bl. PflBau*, xix, pp. 142–164, 1941–2. [Abs. in *Z. PflKrankh.*, liii, 1–3, pp. 142–143, 1943.]

Among the current problems confronting German plant-breeders is the development of resistance to disease. In barley, for example, by means of hybridization resistance to yellow rust (*Puccinia glumarum*) and mildew (*Erysiphe graminis*) has been combined in certain forms, which are now in the hands of private breeders; but the development of immunity from dwarf rust (*P. simplex*) [*P. anomala*] presents greater difficulties, owing to the existence of so many biotypes within the species. However, crosses with resistant four-rowed summer barleys of South

American origin have produced two-rowed resistant forms which are now being back-crossed with yellow rust- and mildew-resistant malting varieties.

Castronovo (Ada M.). **La biología de 'Puccinia rubigo-vera secalis' en la República Argentina.** [The biology of *Puccinia rubigo-vera secalis* in the Argentine Republic.] *Rev. argent. Agron.*, x, 3, pp. 244–249, 2 pl., 1943.

From the results of inoculation experiments conducted in Argentina from 1941 to 1943, it is concluded that *Lycopsis arvensis* is an accidial host of rye rust (*Puccinia rubigo-vera secalis*) [*P. secalina*: *R.A.M.*, xxi, p. 518]. It was experimentally shown that the teleutospores of the fungus need no preliminary resting period for germinating, and that they germinate with difficulty after three months' storage in the herbarium, their germinating capacity decreasing with increasing age.

Pathology and mycology of Corn.—*Rep. Ia agric. Exp. Sta., 1940-41*, Part II, pp. 54–58, 1 fig., [? 1941].

In this report [cf. *R.A.M.*, xx, p. 357], I. E. Melhus states that during the summer of 1940 maize smut (*Ustilago zeae*) reached epidemic proportions in Iowa, infection being favoured by the dry conditions prevailing in spring and early summer. It was ascertained that the severity of gall production on a line of maize was closely related to the percentage of infection. The severity of infection obtained with a sporidial suspension was greater when it was diluted with carrot decoction than with distilled water, greater with triethanolamine oleate as a spreader than with fish-oil soap, and greatest when the suspension was hypodermically injected into susceptible tissues. Under controlled environmental conditions, the extent of gall formation was increased by moderate wilting of the plants when they were exposed to infection, decreased by the presence of water in the leaf whorl or by exposure for 80 hours at 38° C., and inhibited by a combination of wilting and exposure for 96 hours at 38°.

In tests to ascertain the conditions for the production of a good supply of spores of *Diplodia zeae* with a high percentage of germinability, a medium consisting of a water extract of maize meal or oatmeal proved the best. Spore production was greatest at 20° in the light. Spores generally had a much reduced germinability when pycnidial formation was abundant. They appeared to lose their germinability within 14 to 21 days after pycnidial formation. In a study of the root-infecting activity of *D. zeae* on maize under field conditions, partial disinfection of the soil was carried out with formaldehyde at the rate 10 oz. (diluted 1 : 1,000) per 100 sq. ft. The soil was infested by introducing a maize meal-sand culture at the rate of about 50 gm. per 5 ft. row. There was a decrease of 1·8 to 4·5 per cent. in stand count, top growth, and root length of the maize seedlings in the infested soil as compared with the non-infested. In a greenhouse test the corresponding decrease was 15 to 45 per cent.

G. Semeniuk, C. S. Reddy, I. E. Melhus, W. E. Loomis, E. W. Lindstrom, and G. F. Sprague found that premature stalk-dying of maize due to *D. zeae* during 1940 was favoured by wet weather in August. In the first two weeks of September individual maize fields showed from nearly zero to 35 per cent. prematurely dying stalks, with more occurring on the high than in the low places. One field on 23rd October showed 80 per cent. dead stalks, of which 13 per cent. were broken over near the ground. In this field, the ears on the dead stalks averaged 23·7 per cent. less weight than those from green stalks.

In greenhouse tests to develop a suitable technique for utilizing the seedling stage in estimating maize resistance to *D. zeae*, inoculum placed at the seed-level was found to be more injurious to the developing seedlings than inoculum placed 2 or 4 cm. below seed-level.

The report concludes with a brief review by I. E. Melhus, C. S. Reddy, R. H. Porter, and G. Semeniuk of the prevalence, distribution, and losses caused by plant diseases in Iowa during the period under review.

Chilton (S. J. P.). **A heritable abnormality in the germination of chlamydospores of Ustilago zeae.**—*Phytopathology*, xxxiii, 9, pp. 749–765, 1 fig., 1 diag., 1943.

Chlamydospores from certain crosses between monosporidial lines of maize smut (*Ustilago zeae*) were observed to germinate abnormally, giving rise to gnarled and misshapen promycelia that either autolyse before producing sporidia or form only a few of these organs in an irregular manner. The one or more factors for lysis, which was conclusively shown not to be due to an infectious agent of the bacteriophage type, are carried only by certain lines, and segregation for such factors was demonstrated by an appropriate series of crosses. The operation of the factors governing lysis and its associated abnormalities appears to be restricted to the period of meiosis. The promycelia of chlamydospores arising from crosses involving one or more haploid lines carrying the lysis factors displayed a tendency to produce exceptionally large numbers of solopathogenic, apparently diploid sporidia. The solopathogenic lines made normal growth, caused infection on inoculation singly into maize plants [*R.A.M.*, xi, p. 363], and were subject to mutation in the same way as haploid ones. Partial reversion to the normal type of germination occurred in the chlamydospores produced by some solopathogenic lines, as indicated by a decrease in the percentage of abnormal and disintegrating promycelia, and was shown by crosses between the resultant haploid sporidia to persist. As in the case of *Sphacelotheca sorghi*, a correlation was established between abnormally large chlamydospore dimensions and an aberrant form of germination [cf. ibid., xx, p. 299].

Brichet (J.). **Production d'Agrumes 1942–1943 réduite par une météorologie défavorable et une culture déficiente ou intempestive. Le die-back, sa génèse, ses manifestations, ses conséquences.** [Citrus production in 1942–1943 reduced by unfavourable weather and a defective or inopportune system of cultivation. Die-back, its genesis, its manifestations, its consequences.]—*Fruits & Primeurs*, xiii, 132, pp. 10–11, 1943.

Adverse weather conditions, coupled with inappropriate methods of cultivation, are stated to have been responsible for a decline in French Moroccan orange production in 1942–3, the latter factor being largely conditioned by war-time restrictions in the supply of fertilizers, machinery, and other facilities. Neglected or improperly treated trees are liable to suffer from die-back, characterized by withering of the branch tips, sometimes accompanied by gummosis, and cracking of the fruits [cf. exanthema; *R.A.M.*, xxii, p. 241]. The margins of the fissures rapidly harden, and the exposed flesh coarsens, loses its sugar and acidity, and also becomes more or less deeply ruptured. Affected fruits fall to the ground where they become attacked by the green and blue moulds (*Penicillium digitatum* and *P. italicum*), which spread to the healthy oranges.

Control should be based on a readjustment of the cultural technique designed to restore the essential vegetative equilibrium. In addition to these general hygienic precautions, American citriculturists have successfully employed a specific dormant treatment consisting in the application of Bordeaux mixture at normal strength, which exerts a highly stimulatory action on the trees and frequently effects a rapid cure, besides controlling the blue and green moulds. Another method involves the incorporation with the soil under the trees of finely ground copper sulphate at a dosage not exceeding 40 to 50 gm. per sq. m. There is, however, a serious risk of injury to copper-treated trees in the event of subsequent

treatments (within the next six months) against scale insects with hydrocyanic acid.

Turrell (F. M.), Cuneo (F.), Slack (D.), & Carns (H.). **Factors in injury to Citrus by sulphur dusts.**—*Calif. Citrogr.*, xxviii, 11, pp. 286–287, 302, 306–307, 310–311, 4 figs., 2 diags., 4 graphs, 1943.

This is a progress report of laboratory and field studies of the physiology of sulphur injury to citrus fruit, conducted, mainly on lemons, at the California Citrus Experiment Station since 1939. Observations showed that the solid sulphur particles on the surface of dusted fruit volatilize at high temperatures and the gas penetrates the fruit rind. Two reactions occur when gaseous sulphur enters the protoplasm: (1) sulphur is reduced to hydrogen sulphide, and (2) sulphur is oxidized to sulphate. Hydrogen sulphide is produced in larger quantities in the spring than in the summer; its production, per unit of time, increases rapidly with temperature rising from 90° to 120°, and its total production increases up to 115°, and then decreases with further rise in temperature. The gas is capable of penetrating the rind and injuring the citrus fruit, but it has not been ascertained whether it is the causal agent in sulphur burns or only a by-product indicative of an injurious preliminary reaction. The gas does not influence the vitamin C content of the fruit. One of the principal environmental factors influencing sulphur injury is the intensity of sun radiation received and undissipated by citrus fruit by re-radiation or by conduction. High relative humidity, warm air, and lack of air movement are secondary factors influencing sulphur injury.

Turrell (F. M.), Sokoloff (V. P.), & Klotz (L. J.). **Structure and composition of Citrus leaves affected with mesophyll collapse.**—*Plant Physiol.*, xviii, 3, pp. 463–475, 1 col. pl., 1 map, 1943.

Mesophyll collapse of citrus [*R.A.M.*, xx, p. 111] is stated to occur in the coastal regions of all southern California, being largely confined to leaves of orange trees and rarely found in those of lemons. The affected leaves have chlorotic, translucent areas, appearing water-soaked, chiefly but not exclusively in the central portion of the blade; brown, necrotic spots may develop in the translucent areas. Histological examination of affected leaf tissue showed enlarged sponge cells interspersed with collapsed ones, reduced intercellular spaces, and chlorophyll-depleted spongy mesophyll cells. Collapsed tissue invariably contained less calcium and somewhat more potassium, magnesium, nitrogen, chloride, and phosphorus than did normal tissue. The ratio of calcium to potassium was accordingly lower in the collapsed than in the normal tissue. Distribution of the alkaline-earth and alkali bases between the sap and the solid parts of autoclaved leaf tissue also showed similar differences in absolute and relative amounts of calcium and potassium. There was no consistent difference in the sulphur content of collapsed and normal tissue, but the former consistently contained lower percentages of sulphate ion ash than did the latter, while the carbon content (expressed in terms of CO_3) was the same in both.

Kar (P. C.) & Saha (J. C.). **Controlling fruit scab of Pomelo, Citrus grandis Osbeck (=C. decumana Linn.)** —*Sci. & Cult.*, viii, 10, pp. 422–423, 1 fig., 1943.

A severe attack of scab (*Sphaceloma fawcettii*) [*Elsinoe fawcetti*] in the pomelo (the thick-skinned shaddock as opposed to the thin-skinned commercial grapefruit) plantations of the Agricultural Research Station, Dacca, Bengal, was effectively combated by two applications, with an interval of a fortnight, of 5–5–100 Bordeaux mixture plus 0·5 per cent. resin.

Frezzi (M. J.) & Mácola (T.). **'Phytophthora palmivora', causante de la 'podredumbre morena' de los frutos citricos en Córdoba (Argentina).** [*'Phytophthora palmivora'*, the agent of 'brown rot' of Citrus fruits in Córdoba (Argentina).]—*Rev. argent. Agron.*, x, 3, pp. 227–230, 1 pl., 1 fig., 1943.

Phytophthora palmivora was isolated from brown rot of navel orange and lemon fruits in the province of Córdoba, Argentina. Although previously recorded in that country [*R.A.M.*, xx, p. 401], it has not hitherto been associated there with brown rot of citrus. The authors describe the morphological and cultural characters of the fungus, the identity of which was confirmed by Dr. J. T. Middleton and Dr. H. S. Fawcett. In pathogenicity tests, inoculation with cultures of the fungus resulted in infection of unwounded fruits of sweet orange and lemon, while wound inoculations of stems, collars, and fruits gave infection of peach and apple, but not of sweet orange.

Bliss (D. E.). **The spread of Omphalia root rot by offshoots of the Date Palm.**—*Rep. Date Grs' Inst., 1943*, pp. 3–5, 1 map, [1943].

The present situation regarding the *Omphalia* root rot of dates (*O. pigmentata* and *O. traducida*) [*R.A.M.*, xix, p. 591] in the Coachella Valley of California is summed up as follows. Of the 25 orchards in which the disease has been definitely identified, seven have been freed from it by means of soil fumigation with carbon disulphide, while 13 others are stated to represent a serious problem for the entire date industry of the valley, as much propagating material has been taken from them before the nature of the disease has been discovered. The remaining five orchards have small infested areas of one to ten tree spaces which remain in a more or less static condition and which could, therefore, be easily fumigated. Three further orchards are suspected of having areas of infested soil, which might become dangerous should they be replanted with susceptible palms. The author considers that the opportunity for complete eradication of the disease from the valley has already passed. Its spread, however, may be limited by the following means. Replanting with dates should be avoided except where the former plantings are known to have been free from infection, or where the soil has been fumigated. Great care should be taken in selecting disease-free offshoots for propagation, taking them only from healthy palms, and avoiding all within ten tree rows from the closest infected area. It is suggested that prospective buyers should be allowed to select their planting stock directly from the palms, that the movement of offshoots should be recorded for future reference, and that palms known to have originated from infested orchards be held under observation for a period of at least six years after planting.

Harrold (T. J.). **Histological studies of infections of the Cotton hypocotyl by Glomerella gossypii and Fusarium moniliforme.**—*Phytopathology*, xxxiii, 8, pp. 666–673, 5 figs., 1943.

In inoculation experiments on College No. 1 cotton seedlings in water-agar cultures in Petri dishes, *Glomerella gossypii* and *Fusarium moniliforme* [*Gibberella fujikuroi*] pursued similar courses in respect of penetration and mode of development in the host, both acting as intracellular parasites which eventually destroy the host cells. Features of infection by the two fungi include necrosis of the cortex and stele, enlargement of the hypocotyl above the site of invasion, and lateral flattening of the same region at the point of entry of the pathogens. There were, however, several differences between the effects induced by the two parasites. For instance, the hypocotyls attacked by *G. fujikuroi* attained a length of up to 5 in., equal to that of the controls, while those in the *Glomerella gossypii* series reached only 1 in.; the former fungus produced less external mycelium than the latter; and the seedlings infected by *Gibberella fujikuroi* commonly developed

a whorl of lateral roots at the area of ingress, which may account for the stronger tendency to survival in the hosts of this organism than in those harbouring the agent of anthracnose.

De Meillon (B.) & Muspratt (J.). **Germination of the sporangia of Coelomomyces Keilin.**—*Nature, Lond.*, clii, 3861, p. 507, 1 fig., 1943.

Germination was induced in sporangia of *Coelomomyces* [cf. *R.A.M.*, iv, p. 85] found in a larva of a species of *Mucidus* in Northern Rhodesia. When about to germinate a sporangium loses its oil droplets and becomes granular; a slight bulge appears on one side, gradually enlarging and rupturing the outer hard wall, two thin membranes becoming visible, into which the contents of the sporangium flow out. This stage is reached in one to two days. After this, within a few minutes, the two inner membranes become more widely separated, the hitherto closely packed zoospores come to life and are rapidly liberated until the whole sporangium is emptied. During the last stage, the thin membranes appear to remain intact, suggesting that the spores are capable of penetrating without rupturing them. A zoospore measures about 4 μ, and its flagellum is about four times that length.

Ogloblin (A.) & Jauch (Clotilde). **Reacciones patológicas de los Acridios atacados por 'Aspergillus parasiticus'.** [The pathological reactions of the Acrididae attacked by *Aspergillus parasiticus*.]—*Rev. argent. Agron.*, x, 3, pp. 256–267, 4 pl., 2 figs., 1943.

It was observed at the insectary of the Locust Research Institute at José C. Paz, Argentina, that some Acrididae (*Schistocerca cancellata*, *Dichroplus arrogans*, and *D. elongatus*) were frequently fatally attacked by a fungus identified in culture as *Aspergillus parasiticus* [*A. flavus*: *R.A.M.*, ix, p. 766; xi, p. 696]. The identification was confirmed by K. B. Raper, Illinois. The fungus was also observed to subsist saprophytically in nature.

Positive results were obtained in inoculation experiments by placing both insects and spores in chambers with a relative humidity of 70 to 90 per cent. and a temperature of between 30° and 35° C., the spores being blown about in the air by an artificially induced air current. The respiratory channel appears to be the normal means of penetration and the larvae are better adapted to defend themselves from infection than the adult insects, since the entire cuticular lining of the respiratory system is changed during the moult. In the adult insect, the chief means of defence is phagocytosis, primary capsules being formed at the point of entry of the fungus into the tracheal tubes and air sacs. At a later stage, dead matter becomes detached from these foci of inflammation and floats away, giving rise in time to secondary capsules in the body cavity. The fungus invades all tissues of the insect without distinction, but the hyphae are denser in the proximity of the air passages, indicating the great dependence of the fungus on supply of oxygen, a need which is also apparent from its behaviour in culture.

Holloway (J. K.) & Young (T. R.). **The influence of fungicidal sprays on entomogenous fungi and on the purple scale in Florida.**—*J. econ. Ent.*, xxxvi, 3, pp. 453–457, 1943.

In Florida opinion expressed in published papers and verbal reports is not agreed upon the cause of the increase of scale insects following the use of a fungicide. It is attributed by some chiefly to the elimination of the fungi, by others to the inert granular residue from the spray, and by others again to a combination of both factors. The first improved roads in the State were shell- or clay-surfaced and trees bordering such roads were more heavily infected with scales than those farther away; road dust and inert granular residue from sprays were in time proved to be definite factors in scale increase.

In an experiment designed to contrast the influence of inert residues and copper fungicides on the purple scale [*Lepidosaphes beckii*] and two of its most important fungus parasites, *Nectria diploa* and *Sphaerostilbe aurantiicola* [*R.A.M.*, xxii, p. 205], the inert residues were found to be chiefly responsible for the increase of scale following the treatments. The copper fungicides reduced infection of the scale by entomogenous fungi, but the reduction caused no significant difference in scale mortality or in the total infestation. A year after the application of the sprays there was still no significant difference in total infestation attributable to use of copper sprays. The two high-residue treatments had still the highest total infestation. No increase in the percentage of scale infection by entomogenous fungi was secured by the application of a spray of fungus spores.

Benedek (T.). **Unilateral stimulation of Microsporum audouini by a new species of Bacillus.**—*Mycologia*, xxxv, 2, pp. 222–242, 7 figs., 1943.

After pointing out that he has confirmed Conant's observation that *Microsporum audouini*, unlike all other known species of the genus, does not grow on rice medium, the author gives a detailed account of investigations on a new mustard-yellow, pigment-producing, spore-bearing organism, named *Bacillus weidmaniensis* n.sp., found in the primary culture of a strain of *M. audouini*, the evidence indicating unilateral vital stimulation between the two organisms. In the presence of *B. weidmaniensis*, *M. audouini* did grow on rice medium, in some cases producing perfect perithecia. The bacillus is fully described.

Caldwell (S. A. G.). **Flax crop and fibre quality.**—*Text. Manuf.*, lxviii, 808, pp. 168–170, 1 fig., 1942.

In connexion with the extension now proceeding in the British flax-growing industry, the need for stringent precautions against seed-borne disease is strongly emphasized, and the symptoms and life-cycles of the principal fungi transmitted in this matter, viz., rust and firing (*Melampsora lini*) [*R.A.M.*, xxii, p. 310], browning or stem-break (*Polyspora lini*), seedling blight (*Colletotrichum lini*) [*C. linicola*], and wilt (*Fusarium lini*) are described in semi-popular terms. Observations are also made on two nonparasitic disorders, one known as 'yellowing' and liable to confusion with the early stages of seedling blight, and the other as 'droop': the former is probably due to deficiency of potash, the inclusion of which in the fertilizer was found to cure the trouble. Plants affected by 'droop' somewhat resemble those attacked by *F. lini* and usually occur in patches. The fibrous systems of the affected stems are more or less disorganized, the cell walls being swollen and often partially dissolved; the part just above the diseased area dies, while below it stem growth and fibre development proceed normally. Although the damage inflicted on the growing crop by 'droop' is not substantial, most of the fibres are broken off in the subsequent dressing operations and the yield of tow thereby increased. Three fungi are associated with the dead stalks commonly present in the growing crop and yielding a dark, flat, ribbon-like, weak fibre, namely, *Botrytis* [*cinerea*], *Phoma* sp., and *F. lini*.

Vanterpool (T. C.). **Flax diseases.**—*Agric. Ext. Bull. Univ. Saskatch.* 110, 4 pp., 5 figs., 1943.

Notes are given in tabular form on the symptoms and prevention of the chief diseases of flax found in Saskatchewan, followed by brief, practical instructions for the reduction of losses caused by flax diseases in general.

Newhook (F. J.). **Pasmo (Sphaerella linorum) on Flax in New Zealand.**—*N.Z.J. Sci. Tech.*, A, xxiv, 2, pp. 102–106, 3 figs., 1942.

During the season of 1941–2, *Sphaerella linorum* was observed on linen flax

crops at Auckland, Masterton, and Wanganui, but was not detected in a survey of four districts of South Island in January, 1942. Wild flax (*Linum marginale*) [*R.A.M.*, xxii, p. 126] was severely infected in North Island in December, 1941, and January 1942, but at the date of inspection (8th to 13th January), commercial crops at Blenheim and Rangiora were free from the disease, notwithstanding the presence in some fields of the wild host. In greenhouse inoculation experiments on 300 linen flax plants with a spore suspension of the fungus from diseased cotyledons of *L. usitatissimum*, many typical foliar lesions developed in nine days, the stems showing infection after 26 days, and most of the plants being killed by the end of a month. The pathogen was recovered from the diseased material. Spore suspensions of *S. linorum* from *L. marginale* were likewise pathogenic to linen flax.

In tests with hot water (127° F.) and four dusts, only the former gave effective control of seed-borne infection in the Liral Crown variety (ten minutes' immersion), the number of foliar lesions being reduced from 359 to 59; the average for the four dusts was 183.

In retting and scutching experiments on Concurrent linen flax in 1942, the percentages of line fibre obtained from clean, moderately infected, and severely infected plants were 88, 67·9, and 61·8, respectively.

Kar (P. C.) & Saha (J. C.). **A new stem-base disease of Altissima caused by a species of Phytophthora.**—*Curr. Sci.*, xii, 8, pp. 229–230, 1943.

The species of *Phytophthora* responsible for the stem-base rot of roselle hemp (*Hibiscus sabdariffa* var. *altissima*) in Bengal, first reported in 1931 [*R.A.M.*, xi, p. 158], is characterized on potato dextrose agar by ovoid sporangia, 19·2 to 48 by 18 to 33·6 μ, 'with papilla 4·8 to 7·2 μ', and hyphae 4·8 to 9·6 μ in width. Infection usually originates near the collar region, but the brown, shrivelled lesions, $\frac{1}{2}$ to several cm. in length, intersected by fissures revealing the underlying pith may extend 2 to 3 ft. upwards from soil-level. Under the very humid conditions favouring the pathogen gum may be observed to proceed from the older, coalescent lesions. The diseased stems may be partially or entirely girdled, the foliage wilts, and the plants become desiccated and die prematurely. Considerable damage is caused by the stem rot to the valuable, silky fibres of roselle hemp, which is used commercially in the manufacture of ropes, cordage, and the like. Further studies on the organism and its control are in progress.

Hannibal (L. S.). **Mosaic virus in the Amaryllids.**—*Herbertia*, ix, pp. 149–150, 1942.

The writer's attention was recently called to the presence in *Crinum*, *Amaryllis*, and *Hymenocallis* of mosaic disease, which is prevalent, especially in southern California, on the Minister Talma and Bernardino varieties and *triandrus* hybrids of *Narcissus*. The examination of about 140 Amaryllids representing 30 or more genera revealed varying degrees of infection in *Amaryllis rutila* var. *fulgida*, *H. johnsonii*, *H. solandriflora* var. *conspicua*, *A. regina*×*A. fulgida*, *A. aulica*, *A. belladonna*, *Crinum gigantea*, *C. imbriaticum*, *H. occidentalis*, *H. pauciflora*, *H. tenuiflora*, *Urceolina peruviana*, and others.

Grieve (B. J.). **Further observations on Rose wilt virus.**—*Proc. roy. Soc. Vict.*, N.S., liv, 2, pp. 229–238, 2 pl., 1 fig., 1942.

The writer's studies at the University of Melbourne on the morbid anatomy of rose plants infected by the wilt virus [*R.A.M.*, x, p. 733] revealed cellular necrosis in the cortex, medullary rays, and phloem of the canes from the stage of reflexing of the leaflets to their defoliation. The pathological process was shown by microchemical tests to be accompanied by suberization of the walls and the secretion

of a gummy substance. Spherical or oval intracellular bodies were detected in proximity to the nucleus in leaves remaining attached to the plant for some time, but in most cases the leaves abscise shortly after reflexing takes place and before the development of lesions.

The comparative difficulty experienced in the transmission of the rose wilt virus by mechanical means and its serological inactivity strongly suggest its inclusion in the group of viruses characterized by instability *in vitro*. Out of 20 plants T-budded with diseased buds only four effected a union, and of these two successfully transmitted the disease. The controls remained healthy. The analogies between rose wilt and Gigante's virus disease in Italy [ibid., xvi, p. 179] are sufficiently close to point to the identity of the agents, but further comparative investigations are necessary to establish this hypothesis.

Control should be based on general hygienic precautions and the exclusion from local gardens of the susceptible Pernetiana, Hybrid Tea, and Hybrid Perpetual groups.

Creager (D. B.). **Carnation mosaic.**—*Phytopathology*, xxxiii, 9, pp. 823–827, 2 figs., 1943.

The form of carnation mosaic prevalent in Illinois greenhouses is characterized by mottling and streaking of the foliage and breaking of the flowers in coloured varieties, and is believed to be similar to, if not identical with, a trouble previously reported under the name of 'yellows' from the United States (*Circ. N. J. agric. Exp. Sta.* 385, p. 71, 1939), a suspected virus disease in England [*R.A.M.*, xvii, p. 52], and carnation mosaic in Japan [ibid., xvii, p. 506]. Earlier records, however, have furnished no conclusive evidence of the virus origin of the disease, which was secured in the writer's experiments, involving the grafting on 215 healthy King Cardinal plants of infected scions of the same variety and Pink Treasure. Out of the first series of 110 plants, 91 successful grafts were obtained, while the second series of 105 yielded 101. In the former series, 90 of the plants resulting from the 91 effective unions showed definite foliar symptoms, while all the 32 that flowered bore typically broken and distorted blossoms. In the latter experiment, which is still in progress, 78 out of 101 positive grafts have so far developed leaf mottling and flecking, while 20 have produced broken flowers. The 100 ungrafted controls all remained healthy. The infective principle was further shown to be perpetuated through cuttings from diseased plants, and to be disseminated in the field from infected to healthy individuals, probably by means of insects.

Creager (D. B.) & Boewe (G. H.). **Peony anthracnose found in Illinois.**—*Plant Dis. Reptr*, xxvi, 12–13, pp. 280–281, 1942. [Mimeographed.]

In 1941, the authors observed a disease of peonies of the true anthracnose type [cf. *R.A.M.*, xix, p. 541] in three widely separated commercial plantings in southern Illinois. The disease recurred a year later in the same plantings. The affected varieties were Couronne d'Or, Karl Rosenfield, Sarah Bernhardt, William Penn, and Alsace Lorraine, the first-named being the most severely attacked. The disease caused conspicuous reduction in the yield and quality of flowers, complete destruction of the stems, and sometimes the death of entire plants. The stem lesions ranged from small, elongated, reddish spots, which enlarged into lesions with greyish centres and reddish borders, to extensive zonate cankers. Cankered stems were commonly twisted, bent, or curled and infected leaves were often curled and puckered. The buds were blasted when the bud scales and outer petals became infected. A fungus resembling *Gloeosporium fructigenum* [*Glomerella cingulata*] was associated with the lesions. Inoculations of Couronne d'Or plants in the greenhouse with the fungus taken from diseased peonies gave rise to typical

symptoms in apparently unwounded as well as wounded stems and leaves, though similar inoculations with *G. cingulata* from apple fruit lesions failed.

Severin (H. H. P.). **Breaking in color of flowers of annual Phlox caused by the Aster-yellows virus.**—*Phytopathology*, xxxiii, 8, pp. 741–743, 1 fig., 1943.

Annual phlox (*Phlox drummondii*) in the Montara mountains, California, showed both breaking in flower colour and symptoms of aster yellows, which was conveyed to healthy asters by the leafhopper, *Macrosteles divisus* [*R.A.M.*, xxii, p. 206]. Conversely, the aster yellows virus was transferred from celery to phlox by the same agency and caused breaking in the colour of the petals, the symptoms including white veinbanding, virescence, and proliferation of the flowers; in advanced stages the petals are reduced to green leafy structures resembling sepals, sometimes with a dwarfed apical flower lacking one or more petals, while clusters of green flowers frequently develop without proliferation. This is stated to be the first case of a leafhopper-transmitted virus inducing breaking in flower colour.

White (H. E.). **Breeding Snapdragons for resistance to rust.**—*Bull. Mass. agric. Exp. Sta.* 400, 16 pp., 2 figs., 1943. [Abs. in *Exp. Sta. Rec.*, lxxxix, 4, p. 448, 1943.]

Improved strains of *Antirrhinum* [*majus*] highly resistant to rust [*Puccinia antirrhini*] were derived from crosses between greenhouse forcing types and resistant selections developed at the Indiana Agricultural Experiment Station. Resistance was shown to be inherited as a simple dominant factor [*R.A.M.*, xv, p. 228]. A modified dominant type of resistance was observed, moreover, in 80 to 90 per cent. of the progeny arising from crosses between susceptible commercial varieties, which were also suitable in colour and growth habit for greenhouse cultivation. The most resistant of the 56 wild *A.* species and strains tested for reaction to *P. antirrhini* were *A. charidemi*, *A. calycinum*, *A. ibanjezi*, *A. siculum*, and four strains of *A. glutinosum*. Plants propagated from cuttings resisted the disease for three seasons in field and greenhouse trials. No physiologic races of the rust were detected on the resistant hybrids.

Wilhelm (S.). **Observations on the bacterial crown, stem, and bud rot of Delphinium.**—*Phytopathology*, xxxiii, 9, pp. 806–811, 2 figs., 1943.

Excessive soil moisture was shown by recent investigations in California to be highly conducive to the development of perennial *Delphinium* crown rot and stem and bud rot of rocket larkspur (*D. ajacis*) caused by *Erwinia phytophthora* [*R.A.M.*, xvii, p. 605], the incidence of which may be substantially reduced by sparing irrigation in furrows at a distance from the rows, and by planting on low ridges. The period of flower-spike elongation is the critical juncture for infection in both the perennial and larkspur types, presumably owing to the formation at this time of deep cracks in the stem bases. Since the pathogen may persist in the soil in a state of extreme virulence at least from one planting cycle to the next, crop rotation is advisable. The disease, though distinctly more troublesome in the summer months, may also become destructive during the winter. The most susceptible varieties of *D. ajacis* in field plantings are The Dazzler, Miss California, Lilac King, Stock Flowered Dark Blue, Blue Bell, Super Majestic Rose, Lustrous Carmine, and Los Angeles, whilst the Belladonna group of perennials, the native Californian *D. cardinale*, *D. hesperium*, *D. parryi*, and *D. scopulorum* var. *glaucum* are all subject to severe infection, and the Pacific Giant Hybrids and the English hollyhock, Blackmore, and Langdon strains of *D. elatum* are susceptible. On the other hand, *D. chinensis* (*grandiflorum* group) and the spurless *D. cinereum* and *D. tatsienense* appear to be highly resistant in the field.

Baker (K. F.) & Cummings (Katharine). **Control of Pythium root rot of Aloe variegata by hot-water treatment.**—*Phytopathology*, xxxiii, 8, pp. 736–738, 1 fig., 1943.

Pythium ultimum is the agent of a commercially important root rot of nursery plants of *Aloe variegata* in California, where it has hitherto been customary to discard infected material at considerable loss. This may be obviated by immersion of the plants for 20 to 40 minutes (according to size) in water heated to 46° C., which destroys the pathogen without injury to the host. The treated plants may be replanted in clean soil.

Sprague (R.). **The genus Phaeoseptoria on grasses in the western hemisphere.**—*Mycologia*, xxxv, 4, pp. 483–491, 2 figs., 1943.

The author provides a key to segregate *Phaeoseptoria* from certain other genera of the Sphaeropsidales and discusses seven species of this genus on grasses, including three new to science, and four new combinations.

Kreitlow (K. W.). **Ustilago striaeformis. I. Germination of chlamydospores and culture of forma agrostidis on artificial media.** *Phytopathology*, xxxiii, 8, pp. 707–712, 1 fig., 1943.

The chlamydospores of a collection of *Ustilago striaeformis* f. *agrostidis* from two plants of *Agrostis alba* [*R.A.M.*, xv, p. 29] in a Pennsylvanian pasture germinated in tap and distilled water at room temperature without an after-ripening period. Germinability varied among individual chlamydospores originating in an identical sorus or in different sori on the same plant. Momentary treatment of the spores with 95 per cent. ethyl alcohol caused almost instantaneous collapse, but turgidity was regained in water and no permanent damage resulted, whereas exposures of 15 to 30 seconds' duration completely inhibited germination. The chlamydospores withstood several minutes' immersion in di-ethyl ether and survived for at least 30 days in storage at 10° C., though germinability was reduced from 75 to under 10 per cent. under these conditions. Monochlamydospore cultures of the newly discovered collection (14A) of the smut were grown on potato dextrose agar, on which the minimum, optimum, and maximum temperatures for the resultant strictly mycelial form of development were 5°, 20° to 25°, and below 35°, respectively. The colonies fell into two distinct biotypes, one flat and lustrous and the other fluffy and raised, the colour of both being pale buff.

Griffith (R. B.). **A leaf disease of Kentucky Bluegrass.**—*Phytopathology*, xxxiii, 8, p. 745, 1943.

Since 1940 *Septoria oudemansii* has been isolated fairly consistently from Kentucky bluegrass (*Poa pratensis*), which is subject during cool, wet weather, especially in the spring, to a yellowish-brown discoloration involving entire fields and lawns, a recurrence of infection in the autumn frequently being observed. The injury originates on the leaf sheath, through which it may spread to the young leaves or tissues within, eventually killing all the leaves of a shoot. Under somewhat drier conditions, small, dark brown spots may appear on the leaf blades and sheaths. The disease may be responsible for semi-complete defoliation. The pycnidia of the fungus, which are commonly found on dead leaf blades, contain continuous, rarely uni- to biseptate, hyaline spores, 14·5 by 2·5 μ. On potato dextrose agar at 15° C. black, stroma-like bodies were produced in which the pycnidia were embedded. The application of cotton blue to sections of infected foliar tissue showed the organism to be intercellular. Although the occurrence of *S. oudemansii* on *P. pratensis* has been reported from Michigan, Oregon [*R.A.M.*, xxi, p. 493], and the western United States, its importance as a pathogen of bluegrass does not appear to have been previously recognized.

Hollowell (E. A.). **Registration of varieties and strains of Red Clover, I.**—*J. Amer. Soc. Agron.*, xxxv, 9, pp. 830–833, 1943.

The two first red clover varieties to be registered in the United States are Cumberland, Reg. No. 1 and Midland, Reg. No. 2. The former, previously designated Southern Disease Resistant Blend, is resistant to southern anthracnose [*Colletotrichum trifolii*] and crown rot [cf. above, p. 3]. The latter variety, formerly known as Central Corn Belt Blend, is fairly resistant to northern anthracnose [*Kabatiella caulivora*] and winter-hardy.

Hey (A.). **Anbautechnische Massnahmen als Pflanzenschutzmittel im Feldanbau der kleeartigen Pflanzen.** [Cultural-technical practices as plant-protectives in the field cultivation of plants of the Clover family.]—*Forschungsdienst*, xiv, 5–6, pp. 304–329, 1942.

In connexion with the serious shortage of seed of such protein-containing fodders as certain clovers, lucerne, sainfoin (*Onobrychis*) [*sativa*], and serradella (*Ornithopus*) [*sativus*] now prevailing in Germany, the writer gives a valuable survey of the literature dealing with various aspects of the cultivation of these crops, especially in relation to the control of their diseases and pests by modification of cultural practices.

Nicolaisen (W.), Leitzke (B.), & Witzig (I.). **Untersuchungen im Rahmen der Züchtung der Kleearten auf Widerstandsfähigkeit gegen den Kleekrebs (Sclerotinia trifoliorum Erikss.).** [Investigations within the framework of breeding Clover varieties for resistance to Clover stem rot (*Sclerotinia trifoliorum* Erikss.).]—*Phytopath. Z.*, xii, 6, pp. 585–645, 10 figs., 1940.

The following are the chief preliminary results of investigations at the Kiel (Schleswig-Holstein) Institute for Fodder Cultivation on stem rot (*Sclerotinia trifoliorum*) of clover, a disease of great and increasing economic importance [*R.A.M.*, xviii, p. 318 and next abstracts].

Ten seed samples of different species of clover of varying origin were examined for spores, mycelium, and sclerotia. Although only two red clover samples contained three spores resembling those of *S. trifoliorum*, it would appear from field observations that seed transmission does occur. The ascospores are forcibly discharged from the apothecia in 'clouds' 40 to 60 mm. in height, which may be dispersed by the wind and under outdoor conditions are liberated for as long as three weeks.

Observations on the germination of sclerotia from pure cultures on maltyl (barley malt) agar at 18° to 20° C. showed an after-ripening period of at least four weeks to be necessary. Apothecial production is stimulated by the weather normally prevailing in the field in September and October. Hereditary variations in the length of time essential for germination were shown by the sclerotia from different monospore cultures. None of the methods tested for the acceleration of sclerotial germination proved uniformly successful. There was no appreciable reduction of mycelial growth in culture between 10° and 20°, but darkness retarded both mycelial development and the formation of sclerotia in certain strains. Since modifications in environmental and nutritional conditions induce striking differences in the cultural characters of identical clones of *S. trifoliorum*, care must be taken to draw conclusions only on the basis of abundant material. Moreover, even when cultural uniformity is maintained, extensive variations occur in the rate of mycelial growth, the number and size of the sclerotia, and the configuration of the colonies, the collections frequently consisting of a mixture of single strains. Degeneration, expressed primarily by abnormalities of sclerotial formation, was observed in some of the collections.

Single spores of *S. trifoliorum* are easily isolated from the apothecia at 10°, and as the sclerotia arising from such spores produced normal apothecia and ascospores, the fungus is assumed to be monoecious. Mycelial anastomoses were not observed, and thus there is presumably no risk of the development of new physiologic races of the pathogen through heterothallism. Mycelium from monospore cultures was a satisfactory inoculum. Both uni- and binucleate ascospores were produced. Copious deposits of calcium oxalate crystal were a feature of the cultures.

Winter peas and summer and hairy vetch were susceptible to experimental infection with *S. trifoliorum* from red, white, and crimson clovers, while lucerne was also attacked by inoculum from the first two sources. Conversely, isolates of the fungus from peas and hairy vetch were pathogenic to the three above-mentioned species of clover.

The fact that reputedly resistant red clover plants, after infection with one strain of the pathogen, collapsed and died when attacked by other isolates, is considered to point to the existence of physiologic specialization in *S. trifoliorum*, but further experiments are necessary to elucidate this problem.

Frandsen (K. J.). **Meddelelse om Kløverens Bægersvamp (Sclerotinia trifoliorum).** [A note on the Clover cup fungus (*Sclerotinia trifoliorum*).]—*Nord. Jordbr-Forskn.*, xxiv, 1–2, pp. 12–23, 1 fig., 1942.

Following a summary of recent important contributions to the knowledge of clover rot (*Sclerotinia trifoliorum*), a destructive pathogen of the crop in Denmark, the writer describes a preliminary experiment in 1941 to determine the mode of spread of the fungus through the soil. Sclerotia were used as the inoculum, a few grams of which were placed on the surface of the soil in seven flower pots (a different isolate in each) and introduced into the test plots at the end of August, the pots being let into the soil so that their surfaces were on a level with those of the plots. The plants used in the trial were five strains of red clover [*Trifolium pratense*], alsike [*T. hybridum*], white clover [*T. repens*], bird's foot trefoil [*Lotus corniculatus*], snail clover [*Medicago scutellata*], and lady's finger [*Anthyllis vulneraria*]. Early in October, the sclerotia in some of the pots began to produce apothecia, but during the latter part of September mycelial infection was already perceptible in various parts of the plots. One culture only gave mycelium, which severely attacked the plants within its range. As the season advanced, the outbreak assumed a virulent character, especially on the western side of the experimental area, which was protected from the prevailing wind by a hedge. Mycelium crept along the surface of the soil in the humid atmosphere between the plant rows, thereby contributing to the spread of the pathogen, which in some cases seemed to proceed from the dead stems and leaves on the ground to the living plants. It is clear from these observations that the mycelial dissemination of *S. trifoliorum*, without the intervention of apothecia or ascospores, may be of great importance in dense plantings.

The impracticability of combating clover rot by chemical treatment or crop rotation necessitates the development of resistant forms by breeding, and experiments along these lines have been in progress in Denmark for the past 10 to 15 years, but hitherto no really large-scale investigations have proved feasible. In 1940–1 the writer conducted an experiment in mass inoculation on the lines recommended by Nicolaisen *et al.* in Germany [see preceding abstract], involving the use of mycelium instead of ground sclerotia. At the age of eight days, the mycelium from a culture on clover leaf decoction plus dextrose is transferred to a glass cylinder, in which it is thoroughly shaken up with glass pellets so as to disintegrate the hyphae [cf. *R.A.M.*, xxii, p. 81]. In this way a relatively homogeneous mycelial emulsion is obtained, which can be directly applied to the plants by means of an atomizer. For this purpose the seedlings are grown enclosed in

wooden frames, which are transferred to greenhouse benches, covered with a layer of damp peat mould, when the plants reach the age of two or three months. After inoculation it is generally advisable to leave the frames *in situ* for another three or four weeks, by which time the disease should be sufficiently advanced to enable the reactions of the seedlings to be assessed.

It has frequently been claimed by Swedish, German, and Russian workers on the clover rot fungus that late-maturing varieties are more resistant than early ones, but the opposite has so far been the case in Denmark. In the mass-inoculation trial under discussion, for instance, out of 1,800 Øtofte early red clover plants 13·7 per cent. survived, and out of 2,225 medium-late only 6·8.

In an experiment with various isolates of *S. trifoliorum* from red clover, namely, EK-1, 2, 3, 14, and 18 (grouped together) from Øtofte Farm, Lyngby, K-5 from the vicinity of Randers, and K-38 from Svaløf (Sweden), K-5 was more virulent than the EK-isolates on the Øtofte early and medium-late red clovers, 24·6 per cent. of the 1,749 plants inoculated with the latter surviving compared with 10·1 per cent. of the 1,708 on which the former was used, while K-38 was the weakest of all, 23·7 per cent. of the 3,490 plants of miscellaneous lines inoculated with this isolate surviving as against 1·9 of the 3,526 to which the EK-strains were applied.

Studies have further been conducted at Øtofte on the life-history, and more especially the cytology, of *S. trifoliorum* [*R.A.M.*, xxii, p. 98]. In very young cultures anastomoses between the hyphae of different mycelia may be detected, presumably affording further opportunities for nuclear fusion and eventual hybridization between different genotypes. The development of new physiologic races in this manner, and the varying pathogenicity of the fungus in different localities, are likely to present difficulties in breeding for resistance [see preceding and next abstracts].

Nilsson-Leissner (G.). **Skriftligt diskussionsinlägg.** [A written contribution to the discussion.]—*Nord. JordbrForskn.*, xxiv, 1–2, pp. 24–32, 1942.

In this contribution the author observes that the work of breeding for resistance to clover rot (*Sclerotinia trifoliorum*) is to some extent complicated by the detection of physiologic races of the pathogen [see preceding abstracts], but the promising results already secured in mass-inoculation experiments, e.g., with Svalöfs Mercur, Øtofte medium-late, and Weibulls Resistant red clover [*Trifolium pratense*], show the position to be by no means hopeless. At the same time, the wide distribution of the more aggressive biotypes of the fungus must be taken into account. For instance, Mercur, which has shown a resistant reaction to the disease in central and southern Sweden, as well as in Germany [*R.A.M.*, xvii, p. 186], is highly susceptible in the north of Sweden and at Øtofte, Denmark. An experiment has now been in progress for nine years on heavily infested soil at Svalöf, in which the field was divided into two sections, one with English rye grass [*Lolium perenne*] and the other with a mixture of timothy [*Phleum pratense*] and red clover preceding the red clover crop. Mercur consistently gave higher yields than the other four varieties tested over an average of five years, especially on the plots succeeding the grass and clover mixture, and an early Polish line the lowest.

Ramsey (G. B.). **Fruit and vegetable diseases on the Chicago market in 1940 and 1941.**—*Plant Dis. Reptr*, xxvi, 21, pp. 442–452, 1942. [Mimeographed.]

Brief, popular notes are given on the incidence of disease in fruit and vegetables arriving at the Chicago market during 1940 and 1941.

Chandler (W. H.). **Deciduous orchards.**—438 pp., 104 figs., 4 diags., 1 graph, Philadelphia, Lea & Febiger, 1942.

Included in this treatise on the cultivation of deciduous orchard trees, with

special reference to Californian conditions, is much valuable information on nutrient deficiencies and storage disorders.

Notes contributed by the Biological Branch. Wood rot of fruit trees.—*Agric. Gaz. N.S.W.*, liv, 7, pp. 318–322, 10 figs., 1943.

In New South Wales the most common and serious wood rots of fruit trees are yellowish rot (*Polystictus versicolor*) [*R.A.M.*, xvii, p. 327] and heart rot (*Schizophyllum commune*) [ibid., xxi, p. 144]; other locally important rots are red wood rot (*P. cinnabarinus*) [ibid., xi, p. 275], die-back (*Valsa leucostoma*) [ibid., xxi, p. 46], and pink limb blight (*Corticium salmonicolor*) [ibid., xxi, pp. 126, 282].

P. versicolor enters the tree through any exposed surface and spreads along a limb, producing a reddish-brown discoloration and blistering of the bark surface and a yellow staining of the underlying wood. Cracking occurs at the junction of the affected and healthy parts. The bark and wood eventually die. Trees infected for some time may show large cankered areas. *S. commune* gives rise to a blackish ink-like stain on the bark and discolours the underlying wood. The bark may crack longitudinally, and in time cankered areas develop and entire limbs die. *P. cinnabarinus* produces a red stain. *V. leucostoma* attacks only those trees that are in a weakened condition, but is a serious cause of loss, as it kills entire limbs. Entry is effected through injuries, for example, spurs or laterals killed by frost or spray chemicals. The infected wood is brown, and the overlying bark is darker than the adjoining healthy bark. Gum may be produced between the diseased and healthy zones. The first sign of attack is generally leaf wilt on a lateral, the dead limb being left bare. *C. salmonicolor* causes a pink incrustation on the bark, which turns white and cracks.

Control consists in careful tree surgery and the maintenance of a high level of general health.

Cooley (J. S.). **Armillaria root rot of fruit trees in the eastern United States.**—*Phytopathology*, xxxiii, 9, pp. 812–817, 1943.

In the course of surveys of numerous fruit-growing regions of the eastern and central United States, stone fruit trees infected by *Armillaria* [*mellea*] were occasionally detected. The fungus was isolated from peach roots in the sandhills of North Carolina, but no evidence was forthcoming to implicate it in the primary causation of the decline, which may have been associated with adverse environmental factors. Observations covering an eight-year consecutive period on a diseased peach in the coastal plain of Maryland revealed a slow advance of *A. mellea* in the tree itself, but no sign of spread to the surrounding trees. Mostly negative results were obtained from inoculations made at monthly intervals on young pome and stone fruit trees, though in a few instances small, rapidly healing lesions developed on cherry and peach roots [cf. *R.A.M.*, ix, p. 331]. The sparse incidence of the root rot in the eastern as compared with the western States of the American Union may be attributable to the xeric conditions of the west coast inducing host susceptibility [cf. ibid., ix, p. 349].

Brichet (J.). **La chlorose des arbres fruitiers à feuilles caduques.** [Chlorosis of deciduous fruit trees.]—*Fruit & Primeurs*, xiii, 132, pp. 12–16, 1943.

This is a useful summary, based largely on American studies, of the several possible methods of combating lime-induced chlorosis of deciduous fruit, forest, and ornamental trees, e.g., by the introduction of iron into the soil or its direct application by injection into the trunk in the liquid or dry state. Tables are provided showing the appropriate quantities of iron sulphate or other ferrous compounds to be used on trees of varying diameter, the number and depth of the bore holes for the introduction of the chemical, and the radius round the tree to

be covered and depth of the trench for the accommodation of the curative element, according to the method employed.

Remedies of this type, however effective for the moment, cannot replace the long-term benefits conferred by a rational cultural technique, such as that proposed by T. Wallace in England [*R.A.M.*, ix, p. 43] and successfully adapted to Californian conditions, consisting in the use of cover crops of clover or lucerne, which are heavy consumers of lime and require an abundant supply of nitrogen, preferably in the form of ammonium sulphate.

McKay (R.). **Notes on Apple scab in 1942.**—*J. Dep. Agric. Éire*, xl, 1, pp. 129–133, 1943.

This final report on spraying tests against apple scab (*Venturia inaequalis*) at Glasnevin, Eire, since 1935 [*R.A.M.*, xxi, p. 458] gives the results of applications made in 1942 to the trees which had served as unsprayed controls in the earlier experiments. The treatment given was lime-sulphur (1 in 40) at pre-blossom, followed by three post-blossom applications at 1 in 80.

The data showed that on the control trees of Allington Pippin, Annie Elizabeth, Bramley's Seedling, Gascoyne's Scarlet, and King Edward VII sprayed for the first time in 1942, the percentage of clean fruit ranged from 58 to 87; this is regarded as satisfactory in view of the conditions prevailing. The difference, however, in the percentages of clean fruit between these trees and others regularly treated amounted in five pairs out of six to over 21 per cent. in favour of the trees regularly sprayed. Severe infection was 8 to 35 per cent. more prevalent on the previously unsprayed trees than on those regularly sprayed. The fact that better control was obtained on the susceptible but regularly sprayed Bismarck variety than on the other previously untreated varieties demonstrates the importance of regular spraying.

Racicot (H. N.). **The importance of prompt action for the control of fire-blight.**—*Rep. pomol. Soc. Quebec, 1941*, pp. 21–25, 1 fig., [? 1942].

After briefly reviewing the present state of knowledge concerning the conditions necessary for outbreaks of apple fireblight [*Erwinia amylovora*: *R.A.M.*, xx, p. 537; xxii, p. 10], the author states that overwintering or 'hold-over' cankers must be present, and must have exuded. Rain is also necessary, as it lowers the concentrations of the sugars in the nectar of the blossoms and raises the moisture content of the twigs and leaves, thus rendering them susceptible to infection. It also serves to wash off the exudate, which reaches the young shoots and some of the blossoms. If strong winds prevail at the same time, new infections will be even more numerous. Should weather favourable to the flight of pollinating insects ensue, infection may be spread from blossom to blossom. It is essential, however, that some blossoms shall have been inoculated by rain if pollinating insects are to spread the disease; also, if sufficient cankers are present in each tree, rain alone will induce a severe outbreak. If the cankers have not exuded by blossoming time, or if they have exuded, but no rain has fallen during flowering, then little or no blossom infection will occur. If exudation takes place only after blossoming, only twig blight can arise. Pollinating insects often inoculate blossoms situated high up on the tree, with the result that twigs become diseased, and hold-over cankers are formed from which exudate is washed down by rain to most parts of the tree. Such diseased twigs are easily overlooked.

Wilkinson (E. H.). **Dry eye rot of Apples caused by Botrytis cinerea Pers.**—*J. Pomol.*, xx, 3–4, pp. 84–88, 1 pl., 1943.

In further studies of the dry eye rot of apples caused by *Botrytis cinerea* [*R.A.M.*, xxi, p. 459], the pathogenicity of the fungus was confirmed by isolation and

inoculation experiments. Pure cultures of the fungus were obtained in each instance from spores collected during the second stage of the disease [loc. cit.] and from rotted tissue of the first and third stages. Of the 83 isolations made from rotted tissue of the second stage, 56 gave pure cultures and 24 remained sterile; most of the latter were made from affected apples late in the season or during the first month of storage, indicating that the fungus may be killed as a result of desiccation. In inoculation experiments carried out during 1941 and 1942 with Cox's Orange Pippin and Laxton's Superb apples still attached to the tree (and in a small laboratory test with four unspecified varieties), all three stages of the disease were reproduced, but mostly separately. However, when 83 apples with injured calyces were inoculated on the tree and kept moist by a tape seal, all fruits developed the first stage and later, when the seals were removed, 80 passed into the second stage, while the remaining three entered directly into the third stage, as did apples inoculated in the laboratory and kept under moist conditions. It is suggested that a change from high to low humidity plays an important part in the drying-out of the lesions and frequently prevents the disease from developing into a complete soft rot of the fruit. The 1942 results clearly showed that mechanical injury to calyces must occur before infection can develop.

Orton (C. R.). **Report of the Director, West Virginia Agricultural Experiment Station, Morgantown, for the biennium 1940 to 1942.**—*Bull. W. Va agric. Exp. Sta.* 307, 56 pp., 12 figs., 1943.

On p. 36 of this report it is stated that investigations in West Virginia have definitely established the fact that apple measles [*R.A.M.*, xix, p. 603] is not due to any parasitic organism; it may, perhaps, be induced by lack of one or more essential elements in the soil, or by the presence of some toxin. Very extensive experiments demonstrated that the disease is not controlled by applications of boron to the soil. The boron content of affected trees was not lower than that of healthy ones.

Esbjerg (N.). **Versuche zur Konservierung von Äpfeln. VI. Versuche zur Fruchtaufbewahrung unter verschiedenen Lagerverhältnissen.** [Experiments in Apple storage. VI. Experiments in fruit preservation under various storage conditions.]—*Tidsskr. Planteavl*, xlvii, pp. 306–325, 1942. [Abs. in *Chem. Zbl.*, cxiv (i), 21, p. 2251, 1943.]

The author describes the physiological processes accompanying apple storage and the various methods of retarding them by coating the fruit with oil, wax, or similar substances, or wrapping in oiled paper. In investigations carried out in collaboration with A. Jørgensen and E. Søndergaard at the Danish Plant Protection Station and an experimental farm from 1934 to 1942 'gernerfl.', a mixture of '*A*', shellac, castor oil, paraffin oil, and sandarac, gave good control of loss of weight and fungal infection, but increased the incidence of internal breakdown and affected different varieties inconsistently in respect of other storage diseases. Sunflower oil (2 per cent.) proved superior to paraffin, cod liver oil, or soy-bean for coating the apples, which also reacted favourably to wrapping in oiled paper. The results of disinfection tests with sterisol (chloramine) were inconclusive, while storage in diatomol reduced the severity of fungal attacks, but detracted from the appearance of the fruit.

Wormald (H.). **Papery bark canker of fruit trees in relation to silver leaf disease.**—*J. Pomol.*, xx, 3–4, pp. 144–146, 1 pl., 1943.

Observations made at the East Malling Research Station showed that papery bark cankers on branches and stems of top-grafted fruit trees [*R.A.M.*, xix. p. 690] are often, but not invariably, accompanied by silver leaf (*Stereum purpu-*

reum). In 1935, a number of Newton Wonder apple trees that had been top-grafted with Laxton's Superb were found to be severely cankered. The wood in the regions of the cankers was discoloured, and isolations from it yielded pure cultures of *S. purpureum*. In the autumn of 1937, some of these trees bore fructifications of the fungus. Isolations made in 1936 from the wood of papery bark cankers on apple trees yielded *S. purpureum* in three cases and *Polystictus versicolor* in one. Inoculations in 1940 on young Lane's Prince Albert apple trees grown in pots with two isolates of *S. purpureum* from cankered apple, one from plum, and with the above-mentioned strain of *P. versicolor* produced silver-leaf symptoms only on branches inoculated with *S. purpureum* from apple, these also showing the greatest wood discoloration. The tree inoculated with *P. versicolor* showed little discoloration, only slightly more than the uninoculated controls. It is concluded that *S. purpureum* is not the cause of papery bark cankers, but that the same conditions favour both, namely, cutting back the main branches when the tissues contain an abundance of sap. It is, therefore, recommended for the control of both to adopt frame-working in place of top-working. With regard to *P. versicolor* it is established that the fungus is capable of entering grafted trees, but it remains uncertain whether it can act as a parasite.

Harrar (J. G.) & Menzies (J. D.). **Diseases of Pears in Washington.**—*Pop. Bull. Wash. agric. Exp. Sta.* 171, 31 pp., 6 figs., 1943.

The symptomatology, etiology, and control of a number of diseases affecting pears in Washington are described in semi-popular terms. Among them may be mentioned the spur and blossom blight caused by *Botrytis cinerea*, which appears to be confined, on the host in question, to a few localized areas in the Pacific Northwest, the susceptible varieties being Bartlett, Anjou, Cornice, Winter Nelis, and Bosc. Infection spreads from the blighted buds or wilted blossoms to the whole spur, which turns black. The mycelium may proceed to the branch from which the spur arises, but does not usually penetrate far along it. Cankers are often formed at the union of the spur and parent branch, and occasionally so-called 'false fruits' develop in the shape of fleshy swellings just above the cankers. Young fruits are seldom attacked, but in such cases they tend to drop by early summer. The inflorescences are infected by means of the spores copiously produced in early spring, the mycelium subsequently becoming established in diseased spurs and cankers, on which sclerotia are formed in the autumn, to give rise in their turn to the profusion of conidia initiating the new season's infection.

Manns (T. F.). **Peach yellows and little Peach.** *Bull. Del. agric. Exp. Sta.* 236, 2 col. pl., 11 figs., 1 graph, 1942.

In studies carried out in Delaware evidence was obtained that the chief reservoirs locally of both peach yellows and little peach [*R.A.M.*, xx, p. 480] infection is the plum [ibid., xix, p. 388], which is also the chief host on which the vector *Macropsis trimaculata* breeds.

When bearing peach trees were budded simultaneously with buds affected with yellows and little peach, a complex of both was shown in the fruit; this is occasionally found in natural infections when both diseases are active. The period of time required for either condition to appear in peach after budding or grafting was ascertained to depend largely on where the bud or graft is placed, the speed with which union takes place, and the kind of material used. Certain plum varieties, such as Myrobolan (*Prunus cerasifera*) [or *P. divaricata*] and Pissardi (*P. c.* var. *pissardi*), are much more active in bringing about infection than is peach. Infection will appear in four to six weeks in July or August, if infected Myrobolan plum is used, if the buds are placed near the growing point, and if the growing points and lateral branches are cut back. If grafts are made on the roots,

it may take three or four years before the disease becomes apparent. If the buds are placed low on the plant, the time required may be two years.

There is much masking of both diseases in certain plum varieties [ibid., xvii, p. 223], some of which mask them completely, while the vector breeds on them in abundance. *P. cerasifera* (the foundation root-stock on which most cultivated plums are budded) and its var. *pissardi* are examples showing complete masking. Other plum varieties, e.g., Wickson, show symptoms more quickly than peach does, and may succumb the first winter after infection. The author believes that a properly isolated, State-controlled source for virus-free *P.* spp. would be a valuable means of supplying nurserymen with stock free from virus diseases. The yellows and little peach viruses cause continuous growth in the peach and the infected trees fail to become dormant for the winter, with the result that winter-killing is the chief factor causing death.

In an appendix, brief descriptions are given of the symptoms of the chief virus diseases affecting peach, mention being made of those parts of the United States in which each has so far been found.

Fresa (R.). **'Frosty mildew' del Duraznero en el delta del Paraná (Argentina).** ['Frosty mildew' of the Peach in the Paraná Delta (Argentina).]—*Rev. argent. Agron.*, x, 3, pp. 231–234, 1 pl., 1 fig., 1943.

The author records, for the first time in Argentina, the occurrence of *Cercosporella persica*, the cause of frosty mildew of peaches [*R.A.M.*, xvi, p. 759], near the delta of the river Paraná during the years 1937 to 1941. The conidia of the fungus, found on the white foliar spots measured 11 to 64 by 4 to 7 μ. The perfect stage, *Mycosphaerella persica* [loc. cit.] was not observed. Pycnidia and pycnospores, measuring 56 to 84 by 47 to 70 μ and 4·2 to 5·6 by 1 to 1·4 μ, respectively, were found on the necrotic lesions which usually followed upon the white spots, and were also formed in culture, the pycnidia then being 42 to 200 by 42 to 120 μ. Inoculation experiments carried out during 1942 indicated that the fungus is only parasitic when the average maximum temperature is under 25° C.

Wallace (T.) & Jones (J. O.). **The control of manganese deficiency in fruit trees.**—*Rep. agric. hort. Res. Sta. Bristol, 1942*, pp. 18–23, 1 diag., [1943].

Experiments on the control of chlorosis of fruit trees due to manganese deficiency [*R.A.M.*, xx, p. 438] were carried out in 1942 at two centres in the Bristol Province. Satisfactory results were obtained by injecting solid manganese sulphate into stems of apple and plum trees, or by spraying apple trees with manganese sulphate at petal-fall stage and later. Application of manganese sulphate and sulphur as fertilizers was without effect, although sulphur treatment controlled manganese deficiency in Globe beet growing between the trees on the fertilizer plots. Injections of iron or spraying with iron or copper gave no benefit. It is concluded that a commercial control of manganese deficiency in apple trees can be readily achieved by the addition of manganese sulphate at a rate of 3 lb. per 100 gals. to the usual petal-fall lime-sulphur spray. Spraying at a later stage is likely to give poorer results.

Duggan (J. B.). **A promising attempt to cure chlorosis, due to manganese deficiency, in a commercial Cherry orchard.**—*J. Pomol.*, xx, 3–4, pp. 69–79, 1 pl., 1943.

It was observed during a visit to a Kent orchard in 1937 that some 100 cherry trees were chlorotic and that some of these bore no fruit. The disorder first appeared as a yellowing of the leaf spreading from the margins inwards until only the midrib and the bases of the lateral veins remained green; later the interveinal areas gradually became brownish-purple in colour, most markedly so on

the under surfaces; and finally scorching developed from the margins inwards. The size of the leaves and new shoot growth were reduced and eventually first the spurs and then quite large branches died, but in no case was a whole tree killed. The variety Governor Wood was most severely affected, Amber Heart and Roundel Heart less so, and Early Rivers and Bigarreau Napoleon least. From spectrographic analysis of the soil it appeared that the affected trees were suffering from a serious manganese deficiency [see preceding abstract] and a slight lack of magnesium. Attempts to remedy the disorder by the application of farmyard manure failed. Spraying with solutions containing varying amounts of manganese sulphate brought some improvement (particularly manganese sulphate plus lime spray), but this was insufficient for practical purposes. Slightly better results were obtained with liquid injections of manganese sulphate solutions into large branches and whole trees, but the results indicated that injection in quantities sufficient to effect a lasting cure is not yet practicable. In tests carried out from 1939 to 1942, complete control lasting for three growing seasons was obtained by injecting manganese sulphate in solid form into large branches and whole trees. The perfected procedure was to insert tablets of dry manganese sulphate (each less than $\frac{1}{2}$ in. in diameter, $\frac{1}{4}$ in. long, and weighing 1 gm.) into holes spaced round the trunk at intervals, one hole for each 1 in. of the diameter of the trunk, at any convenient height, closing the holes with thin corks. All of the 80 mature trees thus treated in 1942 bore dark green leaves and produced new shoot growth from 4 to 8 in. long, where previously less than 1 in. growth had been made during several years, and nearly all the trees carried a moderate crop.

Wormald (H.). **Field observations on the Cylindrocladium shoot wilt of Plum and Cherry layers.**—*J. Pomol.*, xx, 3–4, pp. 80–83, 1 pl., 1943.

Further details are given on the wilting of plum and cherry layers, observed at the East Malling Research Station in 1932 [*R.A.M.*, xvi, p. 756]. During 1935 and 1936, the disease was responsible for the death of 22 to 62 per cent. of the shoots of plum varieties, and 21 to 49 per cent. of those of cherry grown in an experimental plot; during 1941, about 40 per cent. of the shoots of Brompton and over 50 per cent. of St. Julien A plums were killed in the commercial layer beds. In the same year a similar fungus was isolated from wilted shoots of a cherry root-stock received from Wisley, Surrey.

The disease was shown to be directly correlated with earthing-up operations, no wilting developing in layer rows of common Mussel plum left uncovered during the summer, while in earthed-up rows from 60 to 130 shoots in a row, out of a total of about 2,000, were wilted. The wilting is usually most noticeable during July and early August, and less conspicuous earlier (it first appears in mid-June) or later. It is usually preceded by a yellowing of the foliage, except in the Mahaleb cherry, where the leaves turn a creamy white. The wilting tends to affect lower leaves first, but eventually all flag and wither completely. The lesions, from 2·5 to 9·5 cm. long, usually completely girdle the shoot. Occasionally, however, healthy-looking shoots were found to be only half-girdled, and callus forming at the edges of lesions indicated that further spread of infection had been arrested. On shoots with flagging leaves the lesions are dark brown, but on dead ones they are mostly silvery-grey with microsclerotia showing up clearly when examined with a lens. Microsclerotia were also readily formed in culture, while fructifications of the fungus were observed only in nature, the branched conidiospores each bearing a cluster of cylindrical, colourless, bicellular conidia, about 50 by 5 μ. On many conidiophores the central axis is prolonged beyond the cluster of spores and terminates in a sterile knob. Pending more detailed studies the parasite is tentatively considered to be a cultural variety of *Cylindrocladium scoparium*.

From field observations it is assumed that the parasite is a soil organism and

that the infection is spread through soil. Growers are, therefore, advised against transplanting material for layering from infected plots to new sites; where it must be done, however, the roots should be thoroughly washed in clean, preferably running water to free them from soil which may be infested. The effectiveness of fungicidal treatment has not yet been tested.

Montgomery (H. B. S.), Moore (M. H.), & Hoblyn (T. N.). **A field trial of measures designed for the control of bacterial canker of Victoria Plum trees.**—*Rep. E. Malling Res. Sta., 1942*, pp. 53–61, 1943.

A full account is given of experiments carried out at East Malling since 1932 on the control of plum bacterial canker (*Pseudomonas mors-prunorum*) [see above p. 2], (*a*) by building resistant frameworks upon which to work the susceptible Victoria variety and pruning at a safe time of the year, and (*b*) by spraying. The use of the resistant varieties, Myrobolan B [*Prunus divaricata*], Warwickshire Drooper, Utility, and President to form the stem and crotch of trees on which to graft Victoria successfully prevented the development of stem cankers. Differences were noted in the vigour and cropping of Victoria with different varieties as stems, all on Myrobolan B rootstock, and in the case of Victoria on President stems on Myrobolan B rootstock, the combination was incompatible. Trees pruned in summer showed as many cankers as those pruned in autumn. Spraying the stems and crotch with Bordeaux mixture (10–15–100) in October during the first four years following planting did not successfully control the condition, but spraying the foliage with Bordeaux mixture (4–6–100), particularly three weeks after petal-fall and later, gave appreciable control of the shot-hole stage of infection, and reduced the number of branch cankers, though it did not appreciably reduce the number of stem cankers.

The most salient result of the work was the success that followed the use of a resistant variety upon which to graft Victoria. Whether this resistance will prove permanent is, however, uncertain. President is evidently unsuitable for the purpose, at any rate upon Myrobolan B, because of the apparent incompatibility. From a commercial point of view, Myrobolan B offers the best possibilities, as the stem can be grown on its own roots, and the trees are therefore cheap to produce.

The following tentative recommendations are made. Resistant varieties, such as Myrobolan B or Warwickshire Drooper, should be used to make a framework for valuable susceptible ones. Spraying should be carried out with Bordeaux mixture (4–6–100) about three weeks after petal-fall, and with a colloidal copper preparation diluted to contain approximately 0·025 per cent. metallic copper about three weeks later.

Wormald (H.). **Bacterial diseases of acid Cherry trees.**—*Rep. E. Malling Res. Sta., 1942*, pp. 61–62, 1943.

The most usual symptom of bacterial attack on acid cherries is leaf spot. When numerous spots are present, they are very small and angular, but when the spots are few, they are larger, less angular, sometimes almost circular, and up to $\frac{1}{8}$ in. in diameter. They are dark brown, and the larger ones are generally surrounded by a pale green or yellow halo. If the spots are moderately numerous, the leaves may curl up at the edges, or the leaf-blades may become distorted. Severe leaf-spotting is generally accompanied by bacterial blossom blight, the flower trusses turning almost black and withering. When the flowers are killed, the disease may spread to the twigs, in which case all the leaves and flowers above the invasion site wither up, with the result that twig blight occurs. Further infection may appear as the fruit develops. Portions of the fruit stalks turn brown or black, and fruit development is checked. Dark, sunken spots may appear at the side

or lower end of the fruits. The most serious form of infection occurs when the branches or stems are attacked, because in that case the main limbs and even whole trees are affected, and if girdled, die within a year.

These diseases occur on Morello cherries, but bacterial leaf spots have been observed on the Flemish Red and Kentish Red varieties, and leaf spots and blossom blight on Carnation cherries.

The symptoms described do not necessarily occur together, or in one season. Leaf-spotting occurs almost every year on Morello at East Malling, blossom blight has been observed occasionally, fruit infection was found in two seasons, and fruit stalk lesions were seen only in 1939.

Culture plates from the lesions gave rise to one or other of two kinds of bacterial colonies, referred to as forms A and B. Both were isolated from flower spurs, leaves, fruit stalks, and fruit, while A was also obtained from branches, and on one occasion from a stem. Organism A is regarded as being probably identical with *Pseudomonas mors-prunorum*. On nutrient agar with cane sugar, B colonies have a different structure from those of A [*R.A.M.*, xv, p. 703; xvi, p. 756]. Both were found by inoculation tests to be pathogenic. Each, when sprayed on to Morello foliage, caused leaf spot, and readily infected green Morello fruits when inoculated through punctures; Morello branches were killed by inoculation with A.

Palmiter (D. H.) & Hamilton (J. M.). **Organic materials in pre-harvest sprays for Cherries.**—*Phytopathology*, xxxiii, 8, pp. 683–690, 2 figs., 1943.

Since 1938 the writers have been seeking a substitute for sulphur in the control of cherry brown rot (*Sclerotinia fructicola*) and grey mould (*Botrytis cinerea*) in New York State. Some of the data obtained in orchard trials with fermate (ferric dimethyldithiocarbamate) have already been published [*R.A.M.*, xxii, p. 261], and in the further tests herein described both this preparation and the Jap beetle spray (tetramethyl thiuramdisulphide) were more effective than spergon or micronized sulphur against the two diseases when applied as pre-harvest sprays at 1 in 100 to the Tartarian, Windsor, Schmidt, Giant, and Black Republican sweet varieties. The concentration may be reduced to $\frac{1}{2}$ in 100 if more than one treatment is made or the operations are carried out during the harvest. Used as a pre-harvest spray, fermate was shown by moist-chamber studies and market observations to be superior to the other fungicides tested in prolonging the keeping quality of the cherries: a self-emulsifying cottonseed oil spreader ($\frac{1}{2}$ pint) should be added to lessen the amount of visible residue left on the fruit and to obviate cracking.

Sprayed on to glass slides coated with cellulose nitrate, fermate and Jap beetle proved equally toxic to the conidia of *S. fructicola*, and two to three times more so than micronized sulphur or red copper oxide. Fermate and red copper oxide were experimentally shown to be more adherent than sulphur or Jap beetle, the retentiveness of which was enhanced, however, by the admixture of self-emulsifying cottonseed oil.

Keitt (G. W.) & Moore (J. D.). **Some results from experiments on Cherry leaf spot control in 1942.**—*Wis. Horticulture*, xxxiii, 7, p. 175, 1943.

Cherry leaf spot [*Coccomyces hiemalis*] occurred in an exceptionally severe form in Wisconsin in 1942 [*R.A.M.*, xxi, p. 442] and for the first time fruit infection, especially on the Early Richmond variety, constituted a problem even in well-sprayed orchards. The dissemination of the ascospores was presumably favoured by a series of heavy and protracted rains shortly preceding the second spray (a fortnight after petal-fall), the normally effective Bordeaux residues on the treated foliage being inadequate to prevent the invasion of the fruit under these extreme conditions. In experiments in Door County on Montmorency trees, three

applications of 6–8–100 Bordeaux mixture gave fairly satisfactory control of both foliar and fruit infection, while almost equally good results were obtained with four applications at half strength. Four treatments with Tennessee copper 34 plus lime, 3–3–100, with the addition of orthex, 1–800, gave somewhat inferior protection to that conferred by Bordeaux, the latter being approximately equalled, however, by fermate (ferric dimethyldithiocarbamate) $1\frac{1}{2}$–100, plus lime at the same dosage, for all pre-harvest applications. In the three-spray Bordeaux schedule high-magnesium lime was somewhat more toxic to the fungus than the high-calcium formula.

Condit (I. J.) & Horne (W. T.). **Mosaic spots of Fig fruits.**—*Phytopathology*, xxxiii, 8, pp. 719–723, 2 figs., 1943.

During the past few years 58 out of 4,034 caprifig seedlings at the California Citrus Experiment Station were found to be suffering from mosaic [*R.A.M.*, xx, p. 542], manifested by the presence on the body or neck (the latter being particularly susceptible) of typically circular, crateriform, brownish, necrotic, centrally depressed protrusions, 1 to 6 mm. in diameter, sometimes zonate, with an outer circle up to 10 mm. in diameter. This somewhat unusual type of mosaic, which appears to be narrowly restricted as to its host, closely resembles that observed some 20 years ago on the Samson caprifig variety (*Bull. Calif. agric. Exp. Sta.* 319, pp. 341–377, 1922). On edible figs the mosaic spots may assume various forms, e.g., concentric rings, dark, circular spots, or well-defined, pale green, circular areas. Negative results were given by experiments in the transmission of the mosaic virus from fig leaves to tomato and *Nicotiana glauca* plants.

Drummond (O. A.). **Seca dos galhos da Figueira.** [Canker of Fig branches.]—*Ceres, Minas Gerais*, iii, 15, pp. 162–164, 3 figs., 1941. [English summary.]

In August, 1941, specimens of fig branches severely attacked by canker due to *Phomopsis cinerescens* [*R.A.M.*, xvii, p. 611] were submitted to the author from Caldas, Sul de Minas, Brazil, this being, according to H. H. Whetzel, the first record of the disease from the American Continent. Affected branches may be recognized by the dead bark and wood, covered with numerous dark, slightly raised dots, the pycnidia of the fungus, which are, however, liable to confusion at the first glance with the lenticels and natural rugosities of the healthy cortex. The dry, necrotic, elongated, fairly deep cankers may extend over entire transverse sections of the branch. Diseased trees should be drastically pruned and the wounds treated with Bordeaux paste, while fortnightly applications of Bordeaux mixture are also recommended to prevent the establishment of fresh infections by means of the conidia disseminated before the pruning.

Proprietary products for the control of plant pests and diseases. Scheme for official approval.—*J. Minist. Agric.*, 1, 7, pp. 331–334, 1 fig., 1943.

Further details are given of the scheme for official approval of proprietary fungicides and insecticides by the Ministry of Agriculture [*R.A.M.*, xxii, p. 71]. Products guaranteed by their makers to conform to an agreed official specification accepted by the Joint Panel (including lime-sulphur and tar-oil washes) will normally be approved without further evidence of their efficiency being required. On the other hand, products for which no official specification is as yet available, but of which the chief active ingredients are declared, will be approved only after sufficient evidence of their value has been supplied, e.g., of spraying or dusting properties, as indicated by rate of sedimentation or particle size, of stability in storage. Products, the composition of which the maker wishes to keep secret from the public, are not eligible for approval under the scheme.

Approved products will bear an official mark.

McCallan (S. E. A.) & Wellman (R. H.). **Cumulative error terms for comparing fungicides by established laboratory and greenhouse methods.**—*Contr. Boyce Thompson Inst.*, xiii, 3, pp. 135–141, 1943.

The authors suggest the fungicide × replicate test interaction as a suitable error term for laboratory and greenhouse methods of testing fungicides [*R.A.M.*, xx, p. 544], and give established error terms for certain specified methods together with the necessary differences for a given number of tests.

McCallan (S. E. A.) & Wellman (R. H.). **A greenhouse method of evaluating fungicides by means of Tomato foliage diseases.**—*Contr. Boyce Thompson Inst.*, xiii, 3, pp. 93–134, 4 figs., 9 graphs, 1943.

The authors describe a greenhouse method of testing foliage fungicides, for which tomato (variety Bonny Best) was chosen as an ideal host, and *Alternaria solani*, *Phytophthora infestans*, and, to a lesser degree, *Septoria lycopersici* as suitable parasites. The fungicide was applied with an adjustable paint spray gun to three 6-in. plants placed under a hood on a compound turntable (revolving disk carrying three smaller independently revolving disks). The variables involved were standardized in such a manner that at a 40 lb. constant air pressure for the gun, $2\frac{1}{2}$ fluid valve turns, and 30 seconds' spraying time the plants received 0·75 c.c. of spray per 100 sq. cm. leaf surface. After spraying and drying the plants were subjected to an artificial rain of tap water and then inoculated with a known concentration of spore suspension. This was applied by means of a hand atomizer at 20 lb. pressure for 30 seconds, so that an average of 17 spores was deposited per 1 sq. cm. of leaf surface, using a spore suspension concentration of 10,000 spores per 1 c.c. The plants were then placed for 24 hours in an incubation chamber with a constant relative humidity of 100 per cent., and then returned to the greenhouse. Lesions of *A. solani* and *P. infestans* developed within two or three days, while those of *S. lycopersici* appeared after ten. As lesions of *P. infestans* tend to coalesce, they must be counted before this occurs. The total number of lesions on three leaves was counted. On 6-in. plants the greatest number of lesions usually appeared on the fifth, sixth, and seventh leaf. Per unit area, young plants and leaves were more susceptible than older ones; the relation between number of lesions and leaf position was linear. The number of lesions developing was directly proportional to the number of spores, or motile swarm spores in the case of *P. infestans*, present: the maximum number of the motile swarm spores occurred after about six hours at 10° C.; spores of *A. solani* showed maximum infectivity from three to six days after scraping the cultures; while spores of *S. lycopersici* infected readily from cultures up to four weeks old. Approximately 200 lesions per three leaves may be expected to result from inoculating with 5,000 spores per c.c. of *P. infestans*, 25,000 of *A. solani*, and 200,000 of *S. lycopersici*. The approximate percentages of infection by the spores of the three fungi are, respectively, 6·5, 1·7, and 0·2. The standard deviations for lesions on replicate check plants expressed as a ratio are: 1·25, 1·34, and 1·98 for the three fungi, respectively, the last one differing significantly.

The fungicides studied were Bordeaux mixture, yellow cuprocide, Tennessee copper '34', lime-sulphur, mike sulphur, flotation sulphur, wettable spergon, fermate, and thiosan, all tested three times against *A. solani* and *P. infestans* in dosages of 0·0016, 0·008, 0·04, 0·2, 1·0, and 5·0 per cent. concentration. The lesion counts were expressed as percentages of the control and the results plotted on logarithmic probability paper. For an analysis of variance the LD_{95} (95 per cent. disease control) was demonstrated to be a more precise point to compare fungicides than is LD_{50}, as at the LD_{95} level variance between replicate tests and replicate plants is significantly smaller and for fungicides it is greater, in the case of both diseases, than at the LD_{50} level. All fungicides excepting Bordeaux, which was

convex upward, plotted as straight lines, generally much flatter than for laboratory tests. For both diseases the curves of spergon, lime-sulphur, and flotation sulphur were relatively steep, for fermate and thiosan intermediate, and for the three copper fungicides and mike sulphur very flat. In a laboratory test with Tennessee copper '34' and thiosan against *A. solani*, thiosan gave the steeper dosage-response curves and rated as the better fungicide, as it also did in the greenhouse test.

In conclusion it is recommended that preliminary tests be made with a 0·2 per cent. concentration of spray on one plant, and repeated a second time, while more precise tests should include several dosages at one plant each, repeated several times with a determination of the LD_{95}.

Wellman (R. H.) & McCallan (S. E. A.). **Correlations within and between laboratory slide-germination, greenhouse Tomato foliage disease, and Wheat smut methods of testing fungicides.**—*Contr. Boyce Thompson Inst.*, xiii, 3, pp. 143–169, 11 graphs, 1943.

In order to study the correlations between laboratory and greenhouse methods of testing fungicides, LD_{50} values were determined for 599 compounds by the laboratory slide-germination technique [*R.A.M.*, xxii, p. 145], using *Sclerotinia fructicola*, *Glomerella cingulata*, *Alternaria solani*, and *Macrosporium* [*Stemphylium*] *sarciniforme*; the foliage disease method [see preceding abstract] was applied for ascertaining disease percentages in Bonny Best tomatoes following sprays with 0·2 per cent. concentrations of 56 compounds against *A. solani*, *Phytophthora infestans*, and *Septoria lycopersici*; and finally the percentage of smut (*Tilletia tritici* [*T. caries*] race 10) on artificially infected Hindi wheat (*Triticum aestivum*) following treatments with 0·5 per cent., by seed weight, of 126 compounds was determined. Three replicate determinations were also made for 30 compounds by the slide-germination technique and for 56 compounds by the tomato foliage disease method.

The laboratory fungistatic tests proved more nearly reproducible and more precise than the tomato foliage disease tests. The majority of the compounds examined, the nitrogen, nitrogen plus sulphur or oxygen where tautomerization was impossible, chlorine, and copper compounds, gave as close correlation between slide-germination and tomato foliage disease tests as could be expected in correlating the means of the same number of diseases in the greenhouse. Some of the uranium and chromium compounds were more effective in the laboratory than in the greenhouse, and some of the nitrogen plus sulphur or oxygen compounds, in which tautomerization could exist, were markedly more effective in controlling tomato foliage diseases than would have been anticipated from the results of slide-germination tests, the same marked differences in rating by the two methods persisting, even when the same fungus was used in both tests. Wheat smut results were more highly correlated with tomato foliage disease results than with slide-germination results, particularly in the case of compounds that gave poor correlation between slide-germination and tomato foliage disease results.

In conclusion, it is suggested that in tests with dissimilar compounds, those having LD_{50} values below 100 p.p.m. in the initial slide-germination tests should be given greenhouse disease tests before a selection of compounds is made for field experimentation; and that nitrogen tautomers should be subjected to greenhouse tests regardless of their slide-germination ratings. The slide-germination method, as the more precise, should be used in work with similar compounds or with several lots of the same chemical.

Wellman (R. H.) & McCallan (S. E. A.). **A system for classifying effectiveness of fungicides in exploratory tests.**—*Contr. Boyce Thompson Inst.*, xiii, 3, pp. 171–176, 1 graph, 1943.

A system is described by which fungicides are classified, for purposes of pre-

liminary tests, according to their effectiveness as A, B, C, D, and E, a special class, AA, embracing compounds that give exceptional performance by any of the different testing methods. The methods employed for evaluating the fungicides are: (1) slide-germination test [see preceding abstract] with *Sclerotinia fructicola*, *Glomerella cingulata*, *Alternaria solani*, and *Macrosporium* [*Stemphylium*] *sarciniforme* as test fungi; (2) tomato foliage disease test [loc. cit.] with *A. solani*, *Phytophthora infestans*, and *Septoria lycopersici* on Bonny Best tomatoes; (3) counts of dusted, smutted (*Tilletia tritici*) [*T. caries*] Hindi wheat (*Triticum aestivum*) [loc. cit.]; and (4) greenhouse phytotoxicity test determined by applying single doses or a series of doses of a chemical to bean, buckwheat, and tobacco. For all four methods the results are expressed in a twofold way: for (1) as either test tube dilution LD_{50} in p.p.m. or as settling tower LD_{50} in micrograms deposit per sq. cm.; for (2) as either per cent. disease at 0·2 per cent. spray or as LD_{95} in per cent. spray; for (3) as either per cent. disease at 0·5 per cent. chemical or as LD_{95} in per cent. chemical; and for (4) as either injury at 1 per cent. spray or as threshold of injury as per cent. of spray. The class limits for the four methods are presented in a table. It is intended that, as other methods are developed, similar classes shall be made for the results obtained.

Yarwood (C. E.). **Bordeaux injury to foliage at low temperatures.**—*Plant Physiol.*, xviii, 3, pp. 508–516, 1 fig., 1 graph, 1943.

Following the observation made in California in 1941 that potatoes sprayed with Bordeaux mixture against late blight (*Phytophthora infestans*) appeared to sustain greater injury from frost than did unsprayed plants, the relation of Bordeaux injury [*R.A.M.*, xxi, p. 207] to low temperature was investigated during 1942 under controlled conditions in the greenhouse. The results showed that Bordeaux sprays increase the transpiration of beans over a temperature range from 0° to 37° C., and decrease the leaf temperatures of beans and potatoes (by as much as 3·6° in one test). Exposure to 0° for 12 hours resulted in injury to sprayed bean, potato, cucumber, and cantaloupe foliage. Both sprayed and unsprayed cantaloupe plants showed injury at 0° to 2°, but the sprayed ones were the more severely damaged; at 20° to 34° neither showed marked spray or temperature injury; and at 40° both showed temperature injury without spray injury. Cabbage plants suffered no injury of either kind at any temperature from 0° to 40°. Since wilting was an immediate symptom of Bordeaux injury at low temperatures it is concluded that the injury is directly associated with the water relations of the plant, and is probably a result of the increased water loss due to Bordeaux, combined with decreased absorption and translocation of water at low temperatures.

Colquhoun (T. T.) & Stephen (V. A.). **An air-conditioned experimental cabinet.**—*J. Aust. Inst. agric. Sci.*, ix, 2, pp. 77–80, 4 figs., 1943.

A description is given of an air-conditioned experimental cabinet installed in the Waite Agricultural Research Institute, Adelaide, in which the air is not subjected to wide temperature variations in localized areas, but to small variations over a large surface. This facilitates humidity control. Within the experimental chamber, the air is circulated by two fans, the motors of which are mounted externally, and is kept constantly moving by movable glass slabs in such a way as to overcome dead spots; at the same time the slabs reduce to a minimum the effect of wind velocity within the cabinet. Temperature control is obtained by regulation of the temperature of the brine circulated through the conditioning unit. At present, only high humidities are maintained, but provision has been made for installing apparatus to maintain low ones.

Reed (H. S.). **The production of coacervates.**—*Phytopathology*, xxxiii, 8, pp. 739–740, 2 figs., 1943.

The methylal solution of Sudan III was found to be an extremely useful reagent for staining phenolic coacervates in plant cells [*R.A.M.*, xxii, p. 34], a few c.c. being added to the surface of a catechol solution in a buffer solution at P_H 5·35. After three hours microscopic examination revealed the presence in the solution of globular masses, each enveloped in a vesiculated layer of lecithin, which had assumed an orange-red colour. Similar but smaller coacervates were found in solutions of catechol buffered at P_H 6·35 and 7·35, often with radiating strands of lecithin. Coacervates were obtained with resorcinol dissolved in water, but not in a phosphate buffer solution, while alcohol was also a useful solvent for lecithin, a layer being placed on top of a solution of catechol plus neutral red in a phosphate buffer at P_H 5·35, into which it diffused slowly.

Seed Potato certification.—*J. Minist. Agric.*, l, 6, p. 285, 1943.

Under a new system of certification of seed potatoes which is to come into operation at once in England and Wales, Northern Ireland, and the Isle of Man, certificates for crops of stock seed standard will bear the letters 'SS', those for the highest grade commercial seed will carry the letter 'A', while the general certificates for commercial seed will be marked 'H'. Following these letters the country of origin will be indicated thus, '(E)' for England, '(W)' for Wales, '(Nor. Ir.)' for Northern Ireland, and '(I.O.M.)' for Isle of Man. Finally, 'N.I.' will be added in respect of varieties not immune from wart disease [*Synchytrium endobioticum*]. When seed from a certified crop is offered for sale for planting in England and Wales, the seller must quote the letters and numbers of the relative certificate. Certificates issued this year by the Departments of Agriculture for Scotland and Eire will bear the same designations as before.

Montgomery (H. B. S.) & Shaw (H.). **Field trials of phenyl mercury chloride for the control of Potato blight.**—*Rep. E. Malling Res. Sta., 1943*, pp. 68–70, 1943.

In experiments carried out at East Malling in 1941 and 1942 concentrations of phenyl mercury chloride up to 0·0025 per cent. failed to give any appreciable control of blight (*Phytophthora infestans*) on British Queen potatoes. Unless the use of a substantially higher concentration of mercury becomes economically possible, there appears to be small likelihood that this type of mercury compound will be able to compete with copper preparations for the control of the disease.

Thomas (H. R.). **A nonchromogenic sporulating variant of Alternaria solani.**—*Phytopathology*, xxxiii, 8, pp. 729–731, 1 fig., 1943.

A non-chromogenic saltant of *Alternaria solani* (S-16), producing copious amounts of conidia, in contrast to the normal isolates from tomatoes affected by early blight in Indiana, which secrete a yellowish to deep red pigment in potato dextrose agar and sporulate sparsely, arose from a monospore culture from a leaf collected in California in 1937. It has since proved very useful in laboratory, greenhouse, and field studies on the disease necessitating the availability of large numbers of conidia. None of the conidia from tomato debris collected in Indiana during the winter of 1937–8 gave rise to cultures of the S-16 type, which has been maintained to date, however, by mass transfers on potato dextrose agar; on this medium it has grown more rapidly and diffusely and is superficially darker coloured than the ordinary isolates. The mean dimensions of 25 conidia of S-16 (exclusive of the beak), from artificially infected tomatoes in the field were 72·2±2 by 17·7±1·9 μ, compared with 83·3±1 by 17·3±0·3, 80·5±1·8 by 16·8±0·3, and 94·4±1·4 by 17±0·3 μ, respectively, for three samples of 100 from naturally diseased plants.

Out of three collections of normal conidia (100 in each) two comprised none with fork-beaks, while in the third 62 per cent. were of this type. Among 100 conidia of S-16 from culture, 61 per cent. were fork-beaked, whereas none of the 25 from the field showed the characteristic in question.

In comparative inoculation experiments with suspensions of S-16 and normal conidia no differences were observed in the stem lesions, leaf spots, stem-end rot of the fruit, and spotting of green tomatoes induced by the two forms of *A. solani*.

Knorr (L. C.). **Ring rot of Potatoes.**—*Ext. Bull. Cornell agric. Exp. Sta.* 620 (*War Emergency Bull.* 113), 4 pp., 3 figs., 1943.

Potato ring rot (*Corynebacterium sepedonicum*) [*R.A.M.*, xxii, pp. 220, 223] is so infectious that a cutting knife drawn through an affected tuber will communicate the disease to the next 24 healthy tubers. The surfaces of crates, bags, bins, &c., that have become smeared with the ooze from an affected potato may spread the disease four months after the original contact. Infection may increase from a trace in one season to 60 per cent. in the next. In one county alone the losses from ring rot in a single season were estimated at from 500 to 700 carloads.

The best way to control the disease is to dispose of the infected stock, disinfect all equipment that has contacted affected potatoes, and procure disease-free seed. If certified seed is unobtainable, spread can be minimized by using a continuously sterile cutting knife. Such a knife can be constructed to resemble a circular saw, only with the teeth ground down to a knife edge, which must revolve in a tank of boiling water fastened to the under side of the cutting bench. Alternatively, several ordinary knives may be kept in a disinfectant solution, and after every fifth tuber has been cut, or after every diseased one, the knife used is changed for a clean one.

The cut seed should be dipped immediately in a 1 in 500 mercuric chloride solution for five minutes, and planted as soon as possible afterwards. Mechanical planters, particularly the picker type, in which the pick acts as an inoculating needle, also spread the disease. If ring rot occurs in planting stock, whole seed should be planted.

No tuber from an infected lot should be used for seed the following year; a new, clean source of seed should be found. In addition, all equipment and storage spaces that have come into contact with diseased potatoes, even during the previous season, must be disinfected. Crates, barrels, and baskets should be dipped in copper sulphate solution (2 lb. per 10 gals. water), and planters, diggers, washers, and graders treated in the same way. Bags should be soaked in boiling water. Storage spaces should be cleaned, every tuber being removed, and the walls should then be washed or sprayed with the copper sulphate solution. Rotation is desirable.

This bulletin is illustrated by three figures which will assist in the identification of ring rot.

Foister (C. E.) & Wilson (A. R.). **Dry rot in seed Potatoes. A summary of some recent experiments.**—*J. Minist. Agric.*, l, 7, pp. 300–303, 1943.

Dry rot [*Fusarium coeruleum*: *R.A.M.*, xix, p. 614] is stated to cause each year a certain amount of loss in most early varieties of potatoes, such as May Queen, Ninetyfold, and Arran Pilot, but in some years losses are exceptionally high in certain stocks. Thus, in 1941 and 1943 very serious losses were experienced in England with Doon Star. In investigations carried out in 1941 at the Midland Agricultural College, it was shown that careful handling does not give sufficient control of dry rot, although lifting by fork instead of spinner, dressing by hand instead of machine, and transportation in crates instead of in bags reduced the percentage of tubers affected by dry rot from 58 to 31. It was demonstrated that the only satisfactory means of controlling dry rot was dipping seed potatoes in organo-mercury compounds immediately after lifting. Dipping twice or applying

greening in conjunction with dipping did not give any additional benefit. In no case did dipping reduce the amount of dry rot below 4 or 5 per cent. The problem of de-activation of dips, which was found to be so rapid, in the presence of very dirty tubers, as to render the dipping little or not at all effective, is stated to be under investigation. Tubers should be thoroughly dried after dipping, as failure to do so may result in large losses through soft rots. Although the poisonous nature of mercurial dips, the high cost of dipped potatoes, and various practical difficulties, are stated to hinder the wide adoption of dipping on farms in Scotland, yet it is believed that the practice will become more general for the most susceptible varieties until such time as a better method of control is developed.

Plant protection.—*Qd agric. J.*, lvii, 1, pp. 32–39, 5 figs., 1943.

A brief note is given by R. B. Morwood on potato seed treatment against scab (*Actinomyces scabies*) and other diseases by means of hot formalin and (cold) mercuric chloride, while F. W. Blackford contributes a short, popular account of the symptoms and control of whiptail of cauliflowers and cabbages [*R.A.M.*, xx, p. 507].

Kunkel (L. O.). **Potato witches'-broom transmission by Dodder and cure by heat.** —*Proc. Amer. phil. Soc.*, lxxxvi, 3, pp. 470–475, 4 figs., 1943.

Details are given of nine experiments in which the potato witches' broom virus [*R.A.M.*, vii, p. 663; xxi, p. 301] was transmitted to *Nicotiana glutinosa*, *N. rustica*, tomato, sugar beet, and the Madagascar periwinkle (*Vinca rosea*) by means of the dodder, *Cuscuta campestris* [cf. ibid., xx, p. 590]. In the case of *V. rosea*, exposures to a temperature of 36° C. for seven days or 42° for three cured the tops but not the roots, while complete recovery was effected by 13 days' treatment at 42° [cf. ibid., xxi, p. 340]. Potato tubers up to ¾ in. in diameter responded favourably to six days' exposure to 36°, while potato, tomato, and *V. rosea* plants were benefited, but not altogether cured, by greenhouse summer temperatures exceeding 97° F. for considerable periods of the daylight hours. Witches' broom is stated to be the first potato virus and the ninth plant virus to be cured by heat.

Brickley (W. D.). **Diseased conditions in Potatoes and Peas associated with potash deficiency in south County Kildare.**—*J. Dep. Agric. Éire*, xl, 1, pp. 149–161, 2 figs., 1943.

A brown discoloration of potato foliage caused by potassium deficiency was found to be widespread in south County Kildare from 1940 to 1942. The affected plants were retarded in growth and showed a wrinkling of the leaves. Interveinal yellowing of the older leaves set in, followed by browning or bronzing of the yellow areas on both surfaces. Marginal scorch ensued, and in badly affected crops these leaves gradually withered. A similar disease cycle occurred in younger leaves. In crops most severely affected the stalks lost their turgidity, turned black, and died. Yields became depressed in proportion to the severity of the attack. In all cases when inquiry was made it was ascertained that farmyard manure was used, supplemented occasionally by artificial fertilizers mainly or entirely phosphatic. The condition also occurred on lea, where the potash content was found to be very low. Kerr's Pink was much more susceptible than Arran Consul, and Redskin than Arran Banner or Gladstone. Early varieties were more susceptible than maincrop varieties in the same soil.

Control consists in using a chemical technique to find out the mineral status of a soil where the condition occurs and applying an adequate quantity of potassic fertilizer. A knowledge of the nitrogen and phosphate contents is also necessary, as a relative excess of these also induces potassium deficiency. Localized placements of potash gave better yields than any other method tested.

Experimental evidence also showed potassium deficiency to be the cause of an abnormal condition of field peas; growth was retarded, a chlorotic condition was present, and the leaves viewed from a distance appeared greyish. Later, the older leaves showed scorching at the tip and began to wither, while the younger leaves subsequently became similarly affected. Control is recommended on the same lines as for potatoes.

Tottingham (W. E.), Nagy (R.), Ross (A. F.), Marek (J. W.), & Clagett (C. O.). **A primary cause of darkening in boiled Potatoes as revealed by greenhouse cultures.**—*J. agric. Res.*, lxvii, 5, pp. 177–193, 3 figs., 1943.

Greenhouse studies carried out in Wisconsin from 1934 to 1939 to ascertain why potatoes sometimes darken after boiling [*R.A.M.*, xxi, p. 441] showed that blackening depended most directly on the record of the tubers planted. It was rare, and apparently independent of fertilizer additions, in crops from normal seed stock, but was almost invariably present in crops from discolouring seed stock. The abnormality was common in Rural New Yorker and Irish Cobbler but rare in Chippewa and Triumph.

Differences in the rates of supply of the major nutrient elements and of iron and boron did not affect the condition, which was also independent of the omission of manganese, copper, and zinc, other than as accidental constituents. Boron deficiencies which induced growth disturbances did not cause discoloration of the boiled tubers. Subjection of the developing tubers to heat, drought, and a combination of these factors, did not consistently produce discoloration of the cooked tubers. Spraing [ibid., xviii, p. 201] developed in tubers grown in sand with under 3 per cent. moisture, but was not always associated with blackening after boiling.

The stocks in which the condition occurred appeared to be free from the common potato diseases, but as the tendency to develop the discoloration is inherited, it is thought that an unrecognized virus or some other disease may be present.

Annual Report on the Department of Agriculture, Zanzibar Protectorate, 1942.—7 pp., 1943.

Several problems associated with 'sudden death' of cloves have been approached in the light of A. H. Campbell's conclusion as to the non-parasitic character of the disease [*R.A.M.*, xx, p. 342]. A mulching experiment, started in 1940, was discontinued during the period under review, when it became evident that the malady could not be arrested by this measure once a plantation was invaded. Negative results were likewise obtained in a small-scale trial involving the application of boric acid as a fertilizer for mature trees and saplings, leaf ash analyses having revealed a deficiency of boron in the affected cloves. Underplanting dead and dying old trees with young ones was found to be the most effective method of regeneration.

Conners (I. L.). **The rusts of Safflower.**—*Phytopathology*, xxxiii, 9, pp. 789–796, 1943.

In connexion with the discovery of *Puccinia carthami* on safflower (*Carthamus tinctorius*) in Saskatchewan and Manitoba in 1942, the writer discusses the history, geographical distribution, and taxonomy of the rust, which is believed to have also occurred in Alberta and Ottawa in 1939 and 1940, respectively, judging by the presence of teleutospores on seed samples (of Hungarian origin) from these localities. *P. kentrophylli* Syd. is considered to be a synonym of *P. carthami*, whereas *P. carduncelli* is maintained as a distinct species, which also occurs in *C. calvus* and *Carduncellus caeruleus*.

Two other rusts, namely, *P. verruca* Thüm., and *Aecidium carthami* Dietr., have been reported on safflower. In connexion with the last-named the type host has

been found by K. Eichvald to be a species of *Centaurea* and not *Carthamus tinctorius*. Attention is drawn to an error on the part of Oudemans (*Enumeratio systematica fungorum*, iv, p. 1058, 1923) in listing *A. carthami* as a synonym of *P. carthami*. The same mistake was made in an abstract of Rodighin's paper on safflower diseases in the Volga region in this *Review* [xix, p. 116].

Rich (H.). **Die-back of Safflower in Texas.**—*Plant Dis. Reptr*, xxvi, 12–13, p. 282, 1942. [Mimeographed.]

During 1942 *Carthamus tinctorius* plants in an experimental plot in Texas developed a die-back which ruined 80 per cent. of the crop. The season was a very wet one, with high precipitation and humidity persisting as the young buds began to form, when the disease occurred. The plants died down from the tips and became dry and light brown, with the dead leaves remaining attached to the stem. The avenues of infection appeared to be the scaly bracts of the flowering parts and the stems at the point of attachment of the leaves. In some cases the leaf base became infected, the fungus forming a light brown, elongated lesion which spread up and down the stem. This lesion was observed to girdle the stem, killing all parts of the plant above it. A fungus which was, apparently, a species of *Gloeosporium* was found fruiting abundantly on the stem lesions.

Middleton (J. T.). **Phytophthora rot of Belladonna.**– *Bull. Torrey bot. Cl.*, lxx, 3, pp. 244–251, 3 figs., 1943.

A full account is given of the root, crown, stem, and leaf rot of *Atropa belladonna* caused by *Phytophthora parasitica* in California [*R.A.M.*, xxi, p. 222], this being apparently the first detailed report of the disease in the United States. In addition to information already presented, the minimum, optimum, and maximum temperatures for the growth of the pathogen on maize meal and plain water agar cultures are stated to be 10°, 30° to 32·5°, and 37·5° C., respectively, these relationships and the morphological characters of the fungus agreeing with Tucker's observations on *P. parasitica* [ibid., x, p. 754].

Pythium ultimum is the principal agent of damping-off of *A. belladonna*, followed by *P. de Baryanum* and *P. irregulare*, while *Phytophthora parasitica* is also occasionally responsible for this form of injury, which may be combated by sowing in sterile soil in sterilized containers.

Thirumalachar (M. J.). **A new rust disease of Cardamoms.** *Curr. Sci.*, xii, 8, pp. 231–232, 3 figs., 1943.

Cardamom (*Elettaria cardamomum*) leaves in the plantations round Balehonnur, Mysore, and elsewhere in the same State were observed in 1940 to be attacked by an apparently new rust, designated *Uredo elettariae* n.sp. It is characterized by subepidermal, erumpent, pulverulent, white, aparaphysate uredosori, producing on short pedicels ovate to elliptical, white, echinulate, binucleate spores, 26 to 32·5 by 19 to 27·4 μ, which reinfect the same host, causing secondary symptoms. The first sign of the disease is a minute, yellow spot, which gradually dries up and spreads into a blotch simulating sun scorch. The mycelium continues to perennate along the margin, and under favourable conditions to give rise to fresh sori. The only other rust known on *Elettaria* is *Schroeteriaster elettariae*, recorded by Raciborski from Java in 1900, which differs from the specimen under discussion in its orange-yellow uredospores, measuring 24 to 30 by 15 to 20 μ.

Bell (A. F.). **Downy mildew, Queensland's most important Sugar Cane disease.**—*Proc. Qd Soc. Sug. Cane Technol., 1940*, pp. 155–160, [? 1940].

After discussing the reasons for the increased importance assumed by sugarcane downy mildew [*Sclerospora sacchari*: *R.A.M.*, xxi, p. 503; xxii, p. 276] in

Queensland during the past ten years, and describing how infection is spread, the author states that diseased maize is a much more dangerous menace to adjacent healthy sugar-cane than is affected sugar-cane itself. The varieties approved for planting in the chief Mackay areas are Badila, Clark's Seedling, E.K. 28, Oramboo, Korpi, 1900 Seedling, Co. 290, P.O.J. 2725, D1135, S.J.2, Q20, and Q813, while P.O.J. 2714 and P.O.J. 2878 are allowed in the unaffected northern section where grubs are a serious pest. Of these varieties, Clark's Seedling, Badila, Q20, Q813, Oramboo, Korpi, E.K.28, 1900 Seedling, and P.O.J. 2725 are moderately to highly resistant, and should give little trouble unless grown next to heavily infected cane. D1135 is probably rather more susceptible, and Co. 290 considerably so. P.O.J. 2714 and 2878 are much too susceptible to be grown under present conditions.

The control methods recommended are as follows. Healthy planting material should be selected, and no plant should under any circumstances be taken from within a quarter of a mile of even a single diseased stool. The young plant and ratoon cane should be carefully inspected early in the season (before December if possible), and all diseased stools dug out. Affected fields should be burnt over before harvesting. Maize should not be grown in the vicinity of affected or susceptible sugar-cane.

FORBES (I. L.) & MILLS (P. J.). **Disappearance of virus from mosaic diseased Sugarcane plants.**—*Phytopathology*, xxxiii, 8, pp. 713–718, 1943.

From 1940 to 1942 experiments were carried out in Louisiana to determine the position as regards the presence or absence of the mosaic virus in C[anal] P[oint] 29/320, 28/19, and 33/243 sugar-cane plants from which the pathological symptoms had disappeared [*R.A.M.*, xi, p. 265]. Healthy plants were inoculated with juices from mosaic plants, symptomless plants raised from diseased seed pieces, and plants apparently recovering during the current season. In all the 17 series of tests, involving 790 inoculations, the development of mosaic symptoms followed infection with diseased cane juices, the incidence of attack ranging from 10 to 80 per cent., whereas in 16 out of 17 negative results were obtained with the juices from symptomless and recovered plants: the appearance of mosaic in one out of 15 plants in the one positive trial is attributed to secondary field infection. These data are interpreted as indicating the absence of the virus from the two latter classes of plants. Experiments made in 1942, however, established the liability of apparently healthy plants grown from diseased seed pieces to reinfection by the mosaic virus.

ELLIS (E. A.). **Miscellaneous observations. Plants.**—*Trans. Norfolk Norw. Nat. Soc.*, xv, 4, pp. 371–372, 1942.

The following items are included among a number of recent observations on the occurrence of Uredinales in Norfolk. The teleuto stage of *Puccinia maydis* was detected at Wheatfen in 1941 on maize grown from seed saved from the same garden in the previous year, this being apparently the first published record of the rust in Britain, though Professor W. Brown informed the writer that it was present about 1925 for two consecutive years on plants in the Chelsea Physic Garden. *Uromyces scillarum* has persisted on a colony of cultivated bluebells (*Scilla campanulata*) in Norwich Castle Gardens for 20 years.

KERN (F. D.) & THURSTON (H. W.). **Additions to the Uredinales of Venezuela—II.**—*Mycologia*, xxxv, 4, pp. 434–445, 1943.

These new additions to the annotated list of Venezuelan Uredinales [*R.A.M.*, xviii, p. 141] comprise 33 species, bringing the total up to 238. They include *Phakopsora vignae* on *Phaseolus lunatus*, *Scopella sapotae* on *Achras sapota*, *Uromyces caryophyllinus* on carnation, and *U. flectens* on clover.

Cummins (G. B.). **Uredinales from the Northwest Himalaya.**—*Mycologia*, xxxv, 4, pp. 446–458, 7 figs., 1943.

This annotated list of rusts collected by R. R. Stewart alone or together with I. D. Stewart in the northern part of the United Provinces and in the Punjab, Kashmir, and the North-West Frontier Province of India contains the following interesting records. *Aecidium hederae* Wakefield was found on ivy (*Hedera helix*); the identification is based on a comparison made with type material, and it is pointed out that this name antedates the same name published by Arthur and Cummins in 1933 (*Mycologia*, xxv, p. 398). *A. montanum* is recorded on *Berberis ceratophylla*, *B. petiolaris*, and *B. zabeliana*. *Gymnosporangium clavariaeforme* is a new record for India, infecting both leaves and fruits of *Cotoneaster integerrima* and *C. nummularia*. Although Tranzschel records only *G. fusisporum* on these two hosts, the Indian collections do not show the ridged peridial cells described for that fungus but rather the verrucose ones typical of *G. clavariaeforme*. Another new record for India is *G. confusum* on *Crataegus oxyacantha*, *Pyrus lanata*, and *Juniperus macropoda*. Some uncertainty exists as to the telial collection of this species, for although the galls, teleuto scars, and teleutospores agree fairly well with *G. confusum*, the host on which it was found, *J. macropoda*, grew next to the *C. nummularia* from which *G. clavariaeforme* was collected, and such close association is considered to be highly suggestive, though not conclusive. *Melampsora laricii-epitea* on *Salix hastata* and *S. oxycarpa*, and *Puccinia ribesii-caricis* on black currant are both new records for India. *P. coronata* was found on *Berchemia lineata*, *Rhamnus pentapomica*, and *R. virgata*; *P. graminis* on *Berberis asiatica* and *B. ceratophylla*; and *P. rubigo-vera* on species of *Aconitum*, *Actaea*, *Anemone*, *Aquilegia*, *Clematis*, and *Thalictrum* [cf. *R.A.M.*, xx, p. 293].

Banerjee (S.). **Importance of anatomical characters of the sporophores in the taxonomy-study of Thelephoraceae of Bengal.**—*J. Indian bot. Soc.*, xxi, 1–2, pp. 33–39, 21 figs., 1942.

This is a detailed comparative survey of the anatomical characters of the sporophores of the species of Thelephoraceae occurring in Bengal. The following features have received consideration in the characterization of the different hyphal systems involved in the construction of the fruit bodies: colour, width, wall thickness, septation, branching, contents, clamp- and H-connexions, and disposition in the sporophores. Observations are presented on the basidia, spores, cystidia, setae, gloeocystidia, paraphyses, hyphal pegs, and lactiferous or conducting cells, to all of which diagnostic significance is attached.

Shear (C. L.). **Mycological notes. VII.**—*Mycologia*, xxxv, 4, pp. 469–476, 1943.

Discussing the authorship of *Mycosphaerella grossulariae*, the perfect stage of the currant and gooseberry leaf spot fungus, *Septoria ribis*, the author considers that the correct name should be *M. grossulariae* (Auers.) Lindau, and not *M. grossulariae* (Fries) Lindau as it is commonly cited in the United States. It is uncertain at present whether *M. ribis* (Fckl) Felt. is the same species or not. *Sphaeria melastoma* Fr. 1823 was called *Valsa melastoma* Fr. in 1849 and was renamed *Valsella melastoma* (Fr.) Fckl. No morphological characters of specific value have been found by the author to separate the various species of *Valsella*, and in agreement with Petrak he considers that the genus represents a polysporous condition of *Valsa* [sub-genus *Leucostoma*].

Holmes (F. O.). **A tendency to escape Tobacco-mosaic disease in derivatives from a hybrid Tomato.**—*Phytopathology*, xxxiii, 8, pp. 691–697, 1 diag., 1943.

Detailed evidence is adduced in support of the conclusion that a tendency to

escape infection by the tobacco mosaic virus, introduced by means of abrasion or pruning, in the Chilean tomato (*Lycopersicum chilense* Dun.) and in certain derivatives from its hybridization with the cultivated species, is a heritable character. It remains to be seen whether this property can be transferred to, and incorporated in, commercial tomato varieties without interference with their abundant yields and other attractive qualities.

Lihnell (D.). **Mosaiksjuka och Tabaksvaror.** [Mosaic disease and Tobacco samples.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh.*, vii, 3, pp. 8-12, 3 figs., 1943.

Successful transmission of the tobacco mosaic virus was effected by the application to tobacco and tomato plants of extracts from 7 out of 11 commercial samples (two cigars, three cigarettes, one pipe tobacco, and one snuff), showing the need for extreme care in the avoidance of this source of infection [*R.A.M.*, xvii, p. 560].

Offermann (A. M.). **Determinación del 'Nicotiana virus 1' en Tabacos manufacturados y productos insecticidas.** [Determination of *Nicotiana* virus 1 in manufactured Tobaccos and insecticidal products.]—*Rev. argent. Agron.*, x, 3, pp. 268–274, 2 pl., 1943.

An examination of samples of 56 commercial brands of tobacco, cigars, and cigarettes showed that 37 of them carried *Nicotiana* virus 1 [tobacco mosaic virus: see preceding abstract]. The virus was not found in any of the eight insecticides containing nicotine which were also examined.

Lauffer (M. A.) & Stanley (W. M.). **The denaturation of Tobacco mosaic by urea. I. Biochemical aspects.**—*Arch. Biochem., N.Y.*, ii, 3, pp. 413–424, 1943.

This is an expanded, tabulated account of the writers' studies on the behaviour of the tobacco mosaic virus in neutral 6*M* solutions of urea, a preliminary note on which has already appeared [*R.A.M.*, xviii, p. 630]. The number of measurable sulphydryl groups was found to increase during denaturation by urea, which was further demonstrated to result in a loss of virus infectivity even before extensive disintegration of the nucleoprotein molecule. No method of reversing the over-all denaturation process could be devised.

Bennett (C. W.). **Influence of contact period on the passage of viruses from scion to stock in Turkish Tobacco.**—*Phytopathology*, xxxiii, 9, pp. 818–822, 1943.

Experiments were carried out at the Sugar Plant Field Laboratory, Riverside, California, to determine the requisite periods for the passage from infected scions to healthy stocks of Turkish tobacco of the sugar beet curly top, [tobacco] ring spot, and cucumber mosaic viruses, severally and in combination. No curly top infection developed in plants in which the period of union was less than five days, but symptoms of the other two viruses began to develop with a two-day contact and increased rapidly as the period of contact increased. The ring spot virus appears to move more rapidly than that of cucumber mosaic from scions carrying all three viruses. Of the plants in the triple virus combination series, 23 showed infection by only one virus, 19 contracting ring spot and four cucumber mosaic symptoms only, while of 123 infected by only one virus, 102 suffered from ring spot and 21 from cucumber mosaic. Curly top symptoms failed to appear in grafts in which this virus was associated with one or both the other viruses.

The results show that the curly top, ring spot, and cucumber mosaic viruses can be separated from each other by taking advantage of the contact period required for passage of the respective viruses. The relative slowness of the passage of curly top from diseased to healthy tissues is tentatively attributed to its inability, in contrast to the other two test viruses, to migrate by way of the plasmodesmata

through certain types of parenchyma, resulting in its retention in the scion until phloem differentiation is initiated in the graft union [cf. *R.A.M.*, xvi, p. 650].

Anderson (P. J.). **Tobacco diseases in 1942.**—*Bull. Conn. agric. Exp. Sta.* 469, pp. 106–128, 9 figs., 1943. [Abs. in *Exp. Sta. Rec.*, lxxxix, 4, p. 457, 1943.]

Experiments on the control of tobacco downy mildew [*Peronospora tabacina*] in Connecticut in 1942 gave further promise of success with fermate [ferric dimethyl dithiocarbamate: *R.A.M.*, xxi, p. 506]. Better methods of para-dichlorobenzene [ibid., xxi, p. 505] application were developed, involving its distribution on cheesecloth supported under the glass sash above the plates, a method that proved highly effective even at low temperatures.

Evidence was obtained of the hitherto unrecognized importance of *Botrytis* [? *cinerea*: ibid., xvi, p. 21] and *Sclerotinia sclerotiorum* [ibid., xii, p. 729] in tobacco pathology. The disease complex associated with these two fungi is manifested in the field by a leaf spot and rot and stalk canker, in the seed-bed by rot or damping-off, and in the shed by stalk and pole rot. Control may be effected in the seed-bed by improved ventilation and reduction of humidity, supplemented by spraying with Bordeaux mixture, while pole rot can be combated by the proper firing and airing of the sheds, but no practicable remedy against foliar rot and stalk canker has yet been devised.

Selman (I. W.). **The influence of lime and potash on mosaic infection in the Tomato (var. Potentate) under glass.**—*J. Pomol.*, xx, 3–4, pp. 89–106, 2 pl., 2 diags., 4 graphs, 1943.

In further experiments on the growth of glasshouse tomatoes (variety Potentate) inoculated with tomato [tobacco] mosaic virus [*R.A.M.*, xxii, p. 9], the interaction of infection with two levels of lime- and three of potash-manuring was investigated during 1941 and 1942. The plants were grown in 10 in. pots in steam-sterilized clay loam containing reserves of both lime and potash; five fruit trusses were allowed to develop, and inoculation was carried out when the first truss was in bloom. The appearance of symptoms was delayed where growth was retarded by lime and potash applications. Severe yellow-green foliar mottle was confined to the most vigorous plants grown without additional lime. Despite precautions control plants developed mosaic symptoms seven weeks after the introduction of the virus into the glasshouse, and when examined four weeks later significantly greater numbers of virus-free plants were present where sulphate of potash had not been applied than where it had been; additional liming had no such effect, although it tended to reduce vegetative growth and fruit yield.

A statistical examination of data recorded for each of the five trusses separately showed that the total number of flower buds per plant was not affected by mosaic, but reduced by applications of lime or potash; that the total number of fruits was reduced by mosaic and by liming, but unaffected by potash; that the average fruit weight was reduced by an increased potash level and slightly reduced by mosaic and liming; and that the total weight of fruit was reduced by mosaic, liming, and sulphate of potash. On individual trusses all these values were related to the position of the truss, the maximum total number of fruits being produced on the first and the least on the fifth truss. The highest total yield of fruit was 7 lb. per plant, from uninoculated controls receiving neither additional lime nor potash; of this total, 4 lb. 8½ oz. were ripe, unblemished fruit. The yield of mosaic-infected plants receiving no manurial treatment was 5 lb. 6 oz. (2 lb. 10½ oz.) per plant. Inoculated plants produced a greater number of 'chats' than did the controls, probably owing to virus-induced changes in the water relations of plants. Mosaic infection increased the percentage of fruits showing severe blotchy ripening, which was even more increased by the omission of potash. High potash-manuring

tended to reduce the incidence of blotchy ripening in inoculated plants but to increase it in the controls. Total flower and fruit production was found to be affected similarly by mosaic infection at all levels of lime and potash; significant interactions existed, however, between truss position, potash level, and mosaic infection for flower bud and fruit numbers. It is concluded that at certain stages of development there are differences in the potash requirement of both healthy and infected plants. It appeared that with the variety Potentate potash-manuring should be carefully controlled to insure immunity from accidental infection. When bulky organic manures are not used, lighter potash dressings are likely to increase the total yield of fruit of both healthy and mosaic-infected plants, but may produce fruit of inferior quality.

GRIEVE (B. J.). **Studies in the physiology of host-parasite relations. 4. Some effects of Tomato spotted wilt on growth.**—*Aust. J. exp. Biol.*, xxi, 2, pp. 89–101, 3 figs., 4 graphs, 1943.

The bronzing of Marglobe tomato foliage induced by the tomato spotted wilt virus was experimentally shown at Melbourne University to be associated with a significant reduction of dry weight, height, leaf area, leaf development, and water content of diseased plants in comparison with the healthy controls. The mottling sometimes observed in pot-bound plants or those growing under otherwise adverse conditions caused a less serious loss of weight and did not affect growth in height. The data secured in these tests indicate that, at any rate in part, the virus exerts its effects on dry weight through the partial disorganization and reduction in efficiency of the assimilative tissue, and on height by the destruction of the growth hormone. No correlation could be detected between the growth rate of the seedlings and the incubation period of the virus. The development of mottling in place of bronzing symptoms appears to be connected with changes in the growth rate, host metabolism, and relative virus activity.

MOORE (W. D.), THOMAS (H. R.), & VAUGHAN (E. K.). **Tomato seed treatments in relation to control of Alternaria solani.**—*Phytopathology*, xxxiii, 9, pp. 797–805, 1943.

In five years' experiments in southern Georgia, supplemented by some tests in Indiana and New Jersey, on the control of *Alternaria solani* on tomato [*R.A.M.*, xxi, p. 432] by means of seed treatments, both liquid and dry preparations tended to retard germination during periods of high temperatures combined with a moderate or low rainfall. During the two cool, wet seasons of 1937 and 1941 the organic mercury treatments significantly improved the final incidence of germination, and in the former year mercuric chloride exerted a similar effect. New improved ceresan (1 in 1,200, five minutes' immersion) plus cuprocide dust was the only treatment in the four-year experimental period giving an appreciable reduction of infection by *A. solani*, and that only in 1939, when it decreased the number of leaf spots per plot sample from 40·4 to 22·4. It seems unlikely, therefore, that the preparations so far tested will prove effective against stem canker and leaf spot in the locality under observation.

WELLMAN (F. L.). **A technique to compare virulence of isolates of Alternaria solani on Tomato leaflets.**—*Phytopathology*, xxxiii, 8, pp. 698–706, 1 diag., 1943.

In order to demonstrate relatively slight distinctions in the pathogenic capacities of individual isolates of the tomato early blight fungus (*Alternaria solani*), it was necessary to use a more refined laboratory procedure than that of Andrus *et al.* [*R.A.M.*, xxii, p. 116], and the following technique was therefore devised. Leaflets attached to one-month-old Marglobe seedlings were selected for the tests, and 6 mm. disks from maize meal-cane sugar-agar cultures used as inoculum. The course of

infection in the 1,140 leaflets on 380 plants was studied under controlled conditions of incubation at a temperature of 25° to 27° C. and compared with field observations, the progressive symptoms on diseased leaflets being classified according to numerical grades, which served as virulence indices. Statistical comparisons of the data resulting from controlled inoculation experiments showed the reactions of the leaflets to be reasonably consistent from one test to the next, and hence it was possible to express the relative pathogenicity of the seven isolates included in the trials on a numerical basis.

WAIN (R. L.) & WILKINSON (E. H.). **A preliminary trial of new copper fungicides on outdoor Tomatoes.**—*Rep. agric. hort. Res. Sta. Bristol, 1942*, pp. 56–58, [1943].

This paper presents the results of a small-scale spraying trial for the control of blight (*Phytophthora infestans*) [*R.A.M.*, xxii, p. 45] on outdoor tomatoes. The compounds tested were copper sebacate [ibid., xxii, p. 191], cupric cuprimalate A and B, and Bordeaux mixture, 4 : 4 : 50 and 4 : 4 : 100. As no blight appeared except on one fruit in a control block, no assessment could be made of the protective value of these substances. It was established that none of the new materials was injurious to tomato foliage or fruit. Copper sebacate gave a most conspicuous deposit, which, however, could be easily rubbed off the fruit. The cuprimalate deposits were not clearly visible after drying.

WILLIAMS (P. H.) & SHEARD (ENID). **Stem rot of Tomato caused by Phytophthora parasitica.**—*Gdnrs' Chron.*, Ser. 3, cxiv, pp. 96–97, 2 figs. (one on p. 95), 1943.

During the summer of 1943 a new type of stem rot of tomato caused by *Phytophthora parasitica* was observed on two occasions in Hertfordshire and one in Hampshire. The lesions were 1 to 4 ft. above soil-level. Some were found where leaves had been removed or where the stems had been bruised by the strings, but others appeared to have developed in the absence of mechanical injury. They were greyish-green, elongated, and up to 1 ft. in length. The stems became girdled only at an advanced stage of the disease. The cortex and pith had collapsed, and the outside of the stems was arranged in longitudinal folds.

The condition was reproduced by spraying the stems of healthy tomatoes with a suspension of the zoospores of the fungus, and the fungus was reisolated from the diseased plants. It is considered that the infection probably arose from tomato fruits affected with buck-eye rot. Control measures recommended include the destruction of all fruits affected with buck-eye rot. The plants should be kept trimmed and moist, and stagnant air conditions should be avoided.

LOHMAN (MARION L.) & WATSON (ALICE J.). **Identity and host relations of Nectria species associated with diseases of hardwoods in the United States.**—*Lloydia*, vi, 2, pp. 77–108, 1 fig., 1 graph, 1943.

The object of this paper is to present the morphological and cultural aspects of the species of *Nectria* designated by Spaulding *et al.* Nos. 1 and 2 [*R.A.M.*, xv, p. 542], and now identified as *N. coccinea* on the bark of *Acer saccharophorum* in New England; *N. coccinea* var. *faginata* n. var., isolated from the weak and mostly scale-infested cortex of beech (*Fagus grandifolia*) in New England and the Canadian Maritime Provinces; *N. galligena* from the bark, callus tissue, and recently exposed sapwood of various hosts, including *Acer* spp., birch (*Betula* spp.), beech, ash (*Fraxinus nigra*), *Carya* spp., walnut, poplar (*Populus grandidentata*), aspen, *Prunus serotina*, oak, lime (*Tilia americana*), and elm (*Ulmus americana*), throughout the eastern States, usually in association with cankers and on bud-scale scars; *N. magnoliae* n.sp. from the same portions, generally cankered, of *Liriodendron tulipifera*, *Magnolia fraseri*, and *M. tripetala*, from Connecticut to

Ohio and southwards through the Appalachian forests; and three somewhat aberrant forms of *N. mammoidea* from dead birch in Vermont and dead and living oaks in Maryland and Georgia, respectively.

The specimens of *N. galligena* comprised in these studies agree with the European descriptions of the species or its variety *major*, or with *N. ditissima* sensu Wollenweber and some of its varieties [ibid., vii, p. 677]. The saprophytic *N. coccinea* on sugar maple also corresponds closely with that species on beech in Europe and on *Magnolia* in the eastern States. The pathogenicity of *N. mammoidea* has not been investigated; the few previous records of this species in the eastern States are thought to rest on misidentifications of *N. galligena*.

Only a limited degree of reliability should be attached to any one morphological or cultural character for the diagnosis of *N.* spp., which should be based on ascospore shape and dimensions (mean of 25 free spores from a mixture of asci from several perithecia), micro- and macroconidial shape, and progressive colorations and mycelial habit on standard culture media (synthetic malt and potato dextrose agar and steamed rice). Both *N. galligena* and *N. c.* var. *faginata* were found to comprise pathogenic and non-pathogenic cultural strains, the potential virulence or otherwise of which could not be inferred from any one morphological or cultural character. *N. galligena* cannot be regarded strictly as a canker-producing fungus on Rosaceous hosts, nor was its var. *major* found to be confined to the genus *Fraxinus*. *N. c.* var. *faginata* has not been observed on species of *Acer*, *Betula*, *Carya*, *Juglans*, or *Quercus*, and it owes its recognition, not to reasons of geographical distribution or host specificity, but to its divergence from recent descriptions of European material of *N. coccinea* or its varieties.

An outline of the gross cultural characters on the three above-mentioned media of the species of *Nectria* under discussion is appended for use either in the provisional determination of cultures or specimens, or for the critical identification of the latter when considered in conjunction with the size and shape of ascospores and conidia. The bibliography comprises 40 titles.

GRODSINSKY (L.) & JENKINS (ANNA E.). **'Sphaceloma murrayae' en diversas especies de 'Salix'.** ['*Sphaceloma murrayae*' on various species of '*Salix*'.]—*Rev. argent. Agron.*, x, 1, pp. 55–58, 1 pl., 1 fig., 1943. [English summary.]

A comparative examination of material of species of *Salix* in several herbaria in the United States, besides a collection on *S. viminalis* from the Paraná Delta, Argentina, showed that *Sphaceloma murrayae* [*R.A.M.*, xxii, p. 411] occurs on *S. fragilis*, *S. fragilis*×*S. alba*, *S. lasiolepis* and its var. *sandbergii*, and *S. viminalis*, as well as on *S. babylonica*. The fungus, which causes a leaf spot, is named *Sphaceloma murrayae* n.sp., this description (based on Miss Murray's description of the fungus) being published on 15th March, 1943 [thus antedating that in *Trans. Brit. mycol. Soc.*, xxvi, pp. 1–3, 8th April, 1943].

LIHNELL (D.). **Tetramyxa rhizophaga Lihnell n. sp., ein Parasit in den Wurzeln von Juniperus communis L.** [*Tetramyxa rhizophaga* Lihnell n. sp., a parasite in the roots of *Juniperus communis L.*]—*Symb. bot. upsaliens.*, v, 4, 11 pp., 1 pl., 3 figs., 1942.

In two parts of Sweden the author detected a hitherto unknown representative of the Plasmodiophoraceae occurring as a parasite in juniper roots, and assigned to it the name of *Tetramyxa rhizophaga* n.sp., descriptive of the tetrahedral spore tetrads. The fungus, which is characterized by spheroid or broadly ellipsoid, continuous, subhyaline to light brown spores, 4 to 6 μ in diameter, differs from most of the other Plasmodiophoraceae in its failure to induce hypertrophy of the affected organs. The cytology of the new species is fully described.